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ENVIRONMENTAL PROTECTION AGENCY

■

Control of Air Pollution From New Motor Vehicles and Engines

Title 40—Protection of Environment
CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY
[FRL 387–1]

PART 85—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES

Subpart I—Engine Smoke Exhaust Emission Regulations for New Diesel Heavy Duty Engines

Subpart J—Engine Exhaust Gaseous Emission Regulations for New Diesel Heavy Duty Engines

The need for a number of technical amendments has been identified. These amendments and corrections are set forth in this publication and are described in the table below.

The Agency finds that good cause exists for omitting as unnecessary a notice of proposed rulemaking and public rulemaking procedure in the issuance of these amendments, in that (1) they are designed to correct and clarify the regulations; (2) the changes primarily standardize and improve test and calculation procedures in those areas where the current regulations have been interpreted inconsistently among manufacturers; and (3) to the extent substantive revisions are made they are procedural and do not affect either the stringency of, or the burden of complying with, the standards.

Since numerous technical amendments have been made to Subparts I and J since the November 15, 1972 recompilation, both subparts applicable to diesel heavy duty engines are included in this publication of technical amendments.

Explanation of technical amendment changes

Sec.	Change	Reason
85.801	Update model year	1974 diesel heavy duty engine regulations also apply to later model year engines.
85.802	Combine the definitions for subpts. I and J	Eliminates the need to reprint sec. 85.902.
85.802(a)(11)	Update section reference	These technical amendments are applicable to 1974 and later model year diesel heavy duty engines and all references to 1973 model year engines have been deleted.
85.802(a)(30)	Add definition for throttle	Throttle is commonly used and the definition did not appear previously.
85.803	Combine the abbreviations for subpts. I and J	Eliminates the need to reprint sec. 85.903.
85.804(a)(1)	Update section reference	These technical amendments are applicable to 1974 and later model year diesel heavy duty engines and all references to 1973 model year engines have been deleted.
85.804(a)(2)	Add provision (2)(v), that the vehicle manufacturer is responsible for supplying engine maintenance instructions to the ultimate purchaser, and, if those instructions are modified, the vehicle manufacturer must submit the modifications to the Administrator for review.	Amplifies responsibility of vehicle manufacturers under sec. 85.874–38 to provide maintenance instructions to ultimate purchasers.
85.805	Delete references to sec. 85.873	These technical amendments are applicable to 1974 and later model year diesel heavy duty engines and all references to 1973 model year engines have been deleted.
85.874–1	Expand section title to clarify model year covered.	1974 diesel heavy duty engine emission standards also apply to later model year engines.
85.874–3(c)	Change paragraph reference from sec. 85.705 to sec. 85.805.	Error in previous publication.
85.874–4(a)	Add the requirement that all service performed on test engines be included in the information submitted to the Administrator.	All maintenance performed on test engines is considered pertinent maintenance and therefore is required to be supplied.
85.874–4(c)	Relax requirement to submit description of tests and data derived from those tests conducted to determine compliance with sec. 85.804.	A statement of compliance, and of the availability of the test description and test data will satisfy the requirements.
85.874–4(d)	Proper reference to sec. 85.874–1 was not made; definition of applicable test procedures has been clarified; explain procedure to be followed if engines do not conform to the requirements of this subpart.	Requirement was previously ambiguous; clarifies requirements concerning statement of compliance with general requirements of this subpart; clarifies procedure to be followed.
85.874–5(a)	Add provisions listing criteria for division into engine families which were formerly included only by reference to subpt. A.	Permits engine family classification without the need for referring to subpt. A.
85.874–6	Reorganize into logical subgroupings involving scheduled maintenance, routine service, and unscheduled maintenance with added provisions clarifying the type of work permitted in each maintenance category. Emphasize that unscheduled maintenance will not render the engine unrepresentative.	Clarifies the maintenance provisions.
85.874–6(a)(1)(i)	Change scheduled maintenance on durability engines to require the frequency of such maintenance to be comparable to actual inuse intervals which will be determined by the manufacturer.	Less stringent maintenance criteria is justified in light of data presented to EPA which indicates that the scheduled maintenance provision was not comparable to actual inuse maintenance intervals.
85.874–7(c)	Expand to provide a more precise description of the minimum power requirements during service accumulation.	Clarifies the current requirements for minimum engine power during service accumulation.
85.874–7(g)	Expand to include data reporting procedure; specify time allowed for transmittal of test results.	Clarifies procedures; places a more reasonable requirement on time limit.
85.874–7(h)	Add provision to prohibit any unauthorized testing of certification engines.	Unauthorized testing of certification engines has not been allowed in past practice, provision makes such prohibition explicit.
85.874–8	Delete provision that a manufacturer must apply for use of a special test procedure for engines not suited for normal testing under the specified test procedures.	Allows the Administrator, at his discretion, to make the technical judgment that an engine is not suited for normal testing, and to prescribe special test procedures for that engine.

Explanation of technical amendment changes—Continued

Sec.	Change	Reason
85.874-10	Correct service accumulation fuel specification for type 2-D, E.P. temperature range.	Error in previous publication.
85.874-11	Expand to provide a more precise description of dynamometer operation.	Clarifies test procedure.
85.874-13(b)(3)	Add the requirement for recording of the throttle position and delete the requirement for continuous recording of engine torque.	Throttle position is necessary to verify conduct of the smoke emissions test, the requirement for continuous recording of torque is unnecessary.
85.874-14(g)	Expand to include the identification of throttle position trace.	Allows for revised requirements in sec. 85.874-13.
85.874-14(k)	Specify the minimum requirement for recording engine torque.	Continuous recording of engine torque is no longer a requirement.
85.874-15(b)	Expand to include calibration of throttle position indicator; indicate calibration schedule for opacity filters.	Allows for revised requirements in sec. 85.874-13; defines good technical practice.
85.874-16(c)(8)	Delete the requirement for continuous recording of engine torque; add requirement for continuous recording of throttle position; improper reference to transition "modes" has been corrected.	Requirement for continuous recording of engine torque is unnecessary; reflects revised requirements in sec. 85.874-13; clarifies test procedures.
85.874-17	Expand to provide a more precise description of chart reading and add the requirement that the corrected horsepower developed during the transitional period be at least 95 percent of the horsepower developed during zero-hour testing.	Clarifies the calculation procedures and makes provision consistent with § 85.874-11(a)(3)(i).
85.874-28	Clarify the calculation procedures and the number of significant figures to be used in deterioration factor and official test results. Add the provision that before-maintenance and after-maintenance tests be included in the deterioration factor calculation.	Clarifies calculation procedures. Clarifies what test results are to be used in the deterioration factor calculation.
85.874-29(b)(1)	Clarify data to be used as official test results	Clarifies data reporting procedures.
85.874-29(b)(3)(i)	Add the provision that test engines shall be within the production tolerance as shown on the engine label prior to the official test. Also clarify the maintenance and adjustments may be performed with the advance approval of the Administrator.	Provision allows test engines to be tested in the condition that they are expected to operate inuse. Clarifies test procedure.
85.874-29(b)(3)(ii)	Expand procedure to be followed if an engine fails to meet applicable standards.	Clarifies procedure.
85.874-35(a)(4)(vi)	Revise the language requirement for the engine label required under sec. 85.874-35(a)(4).	Allows more flexibility in determining wording for the required label.
85.874-38(a)	Delete references to "ultimate" when referring to the purchaser.	Engine manufacturers are to supply maintenance instructions to the vehicle manufacturers.
85.874-38(a)(3)	Add provision that the written instructions for new motor vehicle engine maintenance may include maintenance in addition to that performed on the corresponding durability engine under sec. 85.875-6 provided the maintenance is reasonable and necessary.	Provides for reasonable and necessary maintenance instructions.
85.902	Incorporate sec. 85.802 by reference	Eliminates unnecessary repetition.
85.903	Incorporate sec. 85.803 by reference	Do.
85.904	Incorporate sec. 85.804 by reference	Do.
85.905	Incorporate sec. 85.905 by reference	Do.
85.906	Incorporate sec. 85.806 by reference	Do.
85.974-1	Expand section title to clarify model year covered.	1974 diesel heavy duty engine emission standards also apply to later model year engines.
85.974-2	Incorporate sec. 85.874-2 by reference	Eliminates unnecessary repetition.
85.974-3	Incorporate sec. 86.874-3 by reference	Do.
85.974-4	Incorporate sec. 85.874-4 by reference	Do.
85.974-5	Clarify the sequence of testing	Manufacturers may either perform a complete gaseous emissions test or a complete smoke emissions first.
85.974-6	Incorporate sec. 85.874-6 by reference	Eliminates unnecessary repetition.
85.974-7	Incorporate sec. 85.874-7 by reference	Do.
85.974-8	Incorporate sec. 85.874-8 by reference	Do.
85.974-10	Incorporate sec. 85.874-10 by reference	Do.
85.974-11	Add provision for deviation from the specified test procedure.	Allows for testing of engines not suited for testing by normal test procedures.
85.974-12	Incorporate sec. 85.874-12 by reference	Eliminates unnecessary repetition.
85.974-16(c)(5)	Clarify the zero and span requirement	Clarifies the test procedure.
85.974-28	Incorporate sec. 85.874-28 by reference	Eliminates unnecessary repetition.
85.974-29	Incorporate sec. 85.874-29 by reference	Do.
85.974-30	Incorporate sec. 85.874-30 by reference	Do.
85.974-31	Incorporate sec. 85.874-31 by reference	Do.
85.974-32	Incorporate sec. 85.874-32 by reference	Do.
85.974-33	Incorporate sec. 85.874-33 by reference	Do.
85.974-34	Incorporate sec. 85.874-34 by reference	Do.
85.974-35	Incorporate sec. 85.874-35 by reference	Do.
85.974-37	Incorporate sec. 85.874-37 by reference	Do.
85.974-38	Incorporate sec. 85.874-38 by reference	Do.
85.974-39	Incorporate sec. 85.874-39 by reference	Do.

Part 85, Chapter I, Title 40 of the Code of Federal Regulations as applicable beginning with the 1974 model year is amended as follows, effective July 30, 1975.

(Sections 202, 206, 207, 208 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 1857f-1, 1857f-5, 1857f-5a, 1857f-6 and 1857g(a)))

Dated: June 19, 1975.

JOHN QUARLES,
Acting Administrator.

Subpart I—Engine Smoke Exhaust Emission Regulations for New Diesel Heavy Duty Engines

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85.974–35 Labeling.
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85.974–38 Maintenance instructions.
85.974–39 Submission of maintenance instructions.

AUTHORITY: Secs. 202, 206, 207, 208, 301 (a), Clean Air Act, as amended (42 U.S.C. 1857f–1, 1857f–5, 1857f–5a, 1857f–6, 1857g(a)).

Subpart I—Engine Smoke Exhaust Emission Regulations for New Diesel Heavy Duty Engines

§ 85.801 General applicability.

The provisions of this subpart are applicable to new diesel heavy duty engines beginning with the 1974 model year.

§ 85.802 Definitions.

(a) As used in this subpart, all terms not defined herein shall have the meaning given them in the Act:

(1) "Act" means Part A of title II of the Clean Air Act, 42 U.S.C. 1857 f–1 through f–7, as amended by Public Law 91–604.

(2) "Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

(3) "EPA Enforcement Officer" means any officer or employee of the Environmental Protection Agency so designated in writing by the Administrator (or by his designee).

(4) "Model year" means the manufacturer's annual production period (as determined by the Administrator) which includes January 1 of such calendar year: *Provided,* That if the manufacturer has no annual production period, the term "model year" shall mean the calendar year.

(5) "Gross vehicle weight" means the manufacturer's gross weight rating for the individual vehicle.

(6) "Heavy duty vehicle" means any motor vehicle either designed primarily for transportation of property and rated at more than 6,000 pounds GVW or designed primarily for transportation of persons and having a capacity of more than 12 persons.

(7) "Heavy duty engine" means any engine which the engine manufacturer could reasonably expect to be used for motive power in a heavy duty vehicle.

(8) "System" includes any motor vehicle engine modification which controls or causes the reduction of substances emitted from motor vehicle engines.

(9) "Auxiliary Emission Control Device (AECD)" means any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system.

(10) "Defeat Device" means an AECD that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal urban vehicle operation in use, unless (1) such conditions are substantially included in the Federal emission test procedure, or (2) the need for the AECD is justified in terms of protecting the vehicle against damage or accident, or (3) the AECD does not go beyond the requirements of engine starting.

(11) "Engine family" means the basic classification unit of a manufacturer's product line used for the purpose of test fleet selection and determined in accordance with § 85.874–5(a).

(12) "Engine-system combination" means an engine family-exhaust emission control system-fuel evaporative emission control system (where applicable) combination.

(13) "Fuel system" means the combination of fuel tank, fuel pump, fuel lines and fuel injection components, and includes all fuel system vents and fuel evaporative emission control systems.

(14) "Crankcase emissions" means airborne substances emitted to the atmosphere from any portion of the engine crankcase ventilation or lubrication systems.

(15) "Exhaust emissions" means substances emitted to the atmosphere from any opening downstream from the exhaust port of a motor vehicle engine.

(16) "Oxides of Nitrogen" means the sum of the nitric oxide and nitrogen dioxide contained in a gas sample as if the nitric oxide were in the form of nitrogen dioxide.

(17) "Smoke" means the matter in exhaust emissions which obscures the transmission of light.

(18) "Opacity" means the fraction of a beam of light, expressed in percent, which fails to penetrate a plume of smoke.

(19) "Maximum rated horsepower" means the maximum brake horsepower output of an engine as stated by the manufacturer in his sales and service literature and his application for certification under § 85.874–2.

(20) "Rated speed" means the speed at which the manufacturer specifies the maximum rated horsepower of an engine.

(21) "Maximum rated torque" means the maximum torque produced by an engine as stated by the manufacturer in his sales and service literature and his application for certification under § 85.874–2.

(22) "Peak torque speed" means the speed at which an engine develops maximum torque.

(23) "Intermediate speed" means the peak torque speed or 60 percent of rated speed, whichever is higher.

(24) "Percent load" means the fraction of the maximum torque available at a specified engine speed.

(25) "Military engine" means any engine manufactured solely for the Department of Defense to meet military specifications.

(26) "Useful life" means a period of use of 5 years or 100,000 miles of vehicle operation or 3,000 hours of engine operation (or an equivalent period of 1,000 hours of dynamometer operation), whichever first occurs.

(27) "Zero (0) hours" means that point after normal assembly line operations and adjustments are completed and before one (1) additional operating hour has been accumulated.

(28) "Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of engine components or systems which is performed on a periodic basis to prevent part failure or vehicle (if the engine were installed in a vehicle) malfunction.

(29) "Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of engine components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction.

(30) "Throttle" means the mechanical linkage which either directly or indirectly controls the fuel flow to the engine.

§ 85.803 Abbreviations.

The abbreviations used in this subpart have the following meanings in both capital and lowercase:

API—American Petroleum Institute.
ASTM—American Society for Testing and Materials.
BHP—Brake horsepower.
BSCO—Brake specific carbon monoxide.
BSHC—Brake specific hydrocarbons.
BSNO—Brake specific oxides of nitrogen.
CO—Carbon Monoxide.
Conc.—Concentration.
EP—End point.
F—Fahrenheit.
GVW—Gross Vehicle Weight.
HC—Hydrocarbon(s).
Hg—Mercury.
HP.—Horsepower.
Hr.—Hour.
IBP—Initial boiling point.
Lb.—Pound(s).
Min.—Minimum.
NO—Nitric Oxide.
NO—Oxides of Nitrogen.
R.P.M.—Revolutions per minute.
S.A.E.—Society of Automotive Engineers.
WF—Weighting factor.
°—Degrees.
%—Percent.
Σ—Summation.

§ 85.804 General standards: increase in emissions; unsafe conditions.

(a) (1) Every new motor vehicle engine manufactured for sale, sold, offered for sale, introduced, or delivered for introduction into commerce, or imported into the United States for sale or resale which is subject to any of the standards prescribed in this subpart shall be covered by a certificate of conformity issued pursuant to §§ 85.874–2 through 85.874–4 and §§ 85.874–29 through 85.874–34 of this subpart.

(2) No heavy duty vehicle manufacturer shall take any of the actions specified in section 203(a)(1) of the Act with respect to any diesel-powered heavy duty vehicle which uses an engine which has not been certified as meeting applicable standards. Such manufacturer shall provide to the Administrator prior to the beginning of each model year a statement signed by an authorized representative which includes the following information:

(i) A description of the vehicles which will be produced subject to this section;

(ii) Identification of the engines used in the vehicles;

(iii) Projected sales data on each vehicle-engine combination;

(iv) A statement that the engines will not be modified by the vehicle manufacturer or a detailed specification of any changes which will be made. Changes made solely for the purpose of mounting an engine in a vehicle need not be included.

(v) A statement that the engine maintenance instructions supplied by the engine manufacturer, in compliance with § 85.874–38, will be furnished to the ultimate purchaser. If these maintenance instructions are modified, a detailed description of the modifications and a justification for each must be provided to the Administrator for review. The Administrator will notify the manufacturer of his determination whether the modified instructions are reasonable and necessary to assure proper functioning of the emission control system.

(b) (1) Any system installed on or incorporated in a new motor vehicle engine to enable such vehicle to conform to standards imposed by this subpart:

(i) Shall not in its operation or function cause the emission into the ambient air of any noxious or toxic substance that would not be emitted in the operation of such engine without such system, except as specifically permitted by regulation; and

(ii) Shall not in its operation, function, or malfunction result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(2) Every manufacturer of new motor vehicle engines subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with good engineering practice to ascertain that such test engines will meet the requirements of this section for the useful life of the engine.

§ 85.805 Hearings on certification.

(a) (1) After granting a request for a hearing under § 85.874–3 or § 85.874–30, the Administrator will designate a Presiding Officer for the hearing.

(2) The General Counsel will represent the Environmental Protection Agency in any hearing under this section.

(3) If a time and place for the hearing have not been fixed by the Administrator under § 85.874–3 or § 85.874–30, the hearing shall be held as soon as practicable at a time and place fixed by the Administrator or by the Presiding Officer.

(4) In the case of any hearing requested pursuant to § 85.874–30(c)(5)(i), the Administrator may in his discretion direct that all argument and presentation of evidence be concluded within such fixed period not less than 30 days as he may establish from the date that the first written offer of a hearing is made to the manufacturer. To expedite proceedings, the Administrator may direct that the decision of the Presiding Officer (who may, but need not be the Administrator himself) shall be the final EPA decision.

(b) (1) Upon his appointment pursuant to paragraph (a) of this section, the Presiding Officer will establish a hearing file. The file shall consist of the notice issued by the Administrator under § 85.874–3 or § 85.874–30, together with any accompanying material, the request for a hearing and the supporting data submitted therewith and all documents relating to the request for certification and all documents submitted therewith, and correspondence and other data material to the hearing.

(2) The appeal file will be available for inspection by the applicant at the office of the Presiding Officer.

(c) An applicant may appear in person, or may be represented by counsel or by any other duly authorized representative.

(d) (1) The Presiding Officer, upon the request of any party or in his discretion, may arrange for a prehearing conference at a time and place specified by him to consider the following:

(i) Simplification of the issues;

(ii) Stipulations, admissions of fact, and the introduction of documents;

(iii) Limitation of the number of expert witnesses;

(iv) Possibility of agreement disposing of all or any of the issues in dispute;

(v) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

(2) The results of the conference shall be reduced to writing by the Presiding Officer and made part of the record.

(e) (1) Hearings shall be conducted by the Presiding Officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to the exclusion by the Presiding Officer of irrelevant, immaterial, and repetitious evidence.

(2) Witnesses will not be required to testify under oath. However, the Presiding Officer shall call to the attention of witnesses that their statements may be subject to the provisions of title 18 U.S.C. 1001 which imposes penalties for knowingly making false statements or representations, or using false documents in any matter within the jurisdiction of any department or agency of the United States.

(3) Any witness may be examined or cross-examined by the Presiding Officer, the parties, or their representatives.

(4) Hearings shall be reported verbatim. Copies of transcripts of proceedings may be purchased by the applicant from the reporter.

(5) All written statements, charts, tabulations, and similar data offered in evidence at the hearing shall, upon a showing satisfactory to the Presiding Officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute a part of the record.

(6) Oral argument may be permitted in the discretion of the Presiding Officer and shall be reported as part of the record unless otherwise ordered by him.

(f) (1) The Presiding Officer shall make an initial decision which shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made a part of the record. The initial decision shall become the decision of the Administrator without further proceedings unless there is an appeal to the Administrator or motion for review by the Administrator within 20 days of the date the initial decision was filed.

(2) On appeal from or review of the initial decision the Administrator shall have all the powers which he would have in making the initial decision including the discretion to require or allow briefs, oral argument, the taking of additional evidence, or the remanding to the Presiding Officer for additional proceedings. The decision by the Administrator shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the appeal or considered in the review.

§ 85.806 Maintenance of records; submittal of information; right of entry.

(a) The manufacturer of any new motor vehicle engine subject to any of the standards or procedures prescribed in this subpart shall establish, maintain and retain the following adequately organized and indexed records:

(1) *General records.* (i) (A) Identification and description of all certification engines for which testing is required under this subpart. (B) A description of all emission control systems which are installed on or incorporated in each certification engine. (C) A description of all procedures used to test each certification engine. (ii) A properly filed application for certification, following the format prescribed by the US EPA for the appropriate model year, fulfills each of the requirements of this paragraph (a)(1).

(2) *Individual records.* (i) A brief history of each motor vehicle engine used for certification under this subpart in the form of a separate booklet or other document for each separate engine in which shall be recorded:

(A) In the case where a current production engine is modified for use as a certification engine, a description of the process by which the engine was selected, and of the modifications made, giving specifically the place of modification and the person(s) in charge of modification. In the case where the certification engine is not derived from a current production engine, a general description of the build-up of the engine (e.g., experimental heads were cast and machined according to supplied drawings, etc.) giving specifically the place of engine assembly and the person(s) in charge of engine assembly. In both cases above, a description of the origin and selection process for fuel injection components, fuel system components and smoke exhaust emission control components shall be included. The required descriptions shall specify

the steps taken to assure that the certification engine with respect to its fuel system, smoke exhaust emission control components, or any other device or component that can reasonably be expected to influence exhaust emissions will be representative of production engines and that either all component and/or engine construction processes, component inspection and selection techniques, and assembly techniques employed in constructing such engines are reasonably likely to be implemented for production engines or that they are as closely analogous as practicable to planned construction and assembly processes.

(B) A complete record of all emission tests performed under §§ 85.874–9 through 85.874–18 (except tests performed by EPA directly), including all individual worksheets and/or other documentation relating to each such test, or exact copies thereof; the date, time, purpose, and location of each test; the number of hours accumulated on the engine when the test began and ended; and the names of supervisory personnel responsible for the conduct of the test.

(C) The date and times of each service accumulation listing both the number of operating hours accumulated and the name of each dynamometer operator.

(D) If used, the record of any devices employed to record the engine RPM, and/or horsepower and/or torque in relationship to engine operating time.

(E) A record and description of all maintenance and other servicing performed, giving the date and time of the maintenance or service, the reason for it, the person authorizing it, and the names of supervisory personnel responsible for the conduct of the maintenance or service. The description shall indicate whether or not EPA specifically consented to the work and, if EPA did not, shall list the provision of this subpart which authorizes its performance.

(F) A record and description of each test performed to diagnose engine or emissions control system performance, giving the date and time of the test, the reason for it, the person authorizing it, and the names of supervisory personnel responsible for the conduct of the test.

(G) The dates and times that the engine was idle in storage, and in transit or transport.

(H) A brief description of any significant events affecting the engine during any time in the period covered by the history not described by an entry under one of the previous headings including such extraordinary events as accidents involving the engine or dynamometer runaway.

(ii) Each such history shall be started on the date that the first of any of the selection or build up activities in paragraph (a)(2)(i)(A) of this section occurred with respect to the certification engine, shall be updated each time the operational status of the engine changes or additional work is done on it, and shall be kept in a designated location.

(3) This paragraph shall apply to the extent practicable to certification testing of engines for the 1975 model year and in full to all subsequent model years.

(4) All records required to be maintained under this subpart shall be retained by the manufacturer for a period of six (6) years after issuance of all certificates of conformity to which they relate. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending on the record retention procedures of the manufacturer, *provided*, That in every case all the information contained in the hard copy shall be retained.

(b) The manufacturer of any new motor vehicle engine subject to any of the standards prescribed in this subpart shall submit to the Administrator at the time of issuance by the manufacturer copies of all instructions or explanations regarding the use, repair, adjustment, maintenance, or testing of such engine relevant to the control of exhaust emissions, issued by the manufacturer for use by other manufacturers, assembly plants, distributors, dealers, and ultimate purchasers: *Provided*, That any material not translated into the English language need not be submitted unless specifically requested by the Administrator.

(c)(1) Any manufacturer who has applied for certification of a new motor vehicle engine subject to certification tests under this subpart shall admit or cause to be admitted any EPA Enforcement Officer during operating hours on presentation of credentials to any of the following:

(i) Any facility where any such tests or any procedures or activities connected with such tests are or were performed.

(ii) Any facility where any new motor vehicle engine which is being, was, or is to be tested is present.

(iii) Any facility where any construction process or assembly process used in the modification or build up of such an engine into a certification engine is taking place.

(iv) Any facility where any record or other document relating to any of the above is located.

(2) Upon admission to any facility referred to in paragraph (c)(1) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any part or aspect of such procedures, activities, and testing facilities, including, but not limited to, monitoring engine preconditioning, emissions tests and service accumulation, maintenance, and engine storage procedures; and to verify correlation or calibration of test equipment;

(ii) To inspect and make copies of any such records, designs, or other documents; and

(iii) To inspect and/or photograph any part or aspect of any such certification engine and any components to be used in the construction thereof.

(3) In order to allow the Administrator to determine whether or not production motor vehicle engines conform in all material respects to the design specification which applied to those engines described in the application for certification for which a certificate of conformity has been issued and to standards prescribed under section 202 of the Act, any manufacturer shall admit any EPA Enforcement Officer on presentation of credentials to both:

(i) Any facility where any document, design, or procedure relating to the translation of the design and construction of engines and emission related components describe in the application for certification or used for certification testing into production engines is located or carried on; and

(ii) Any facility where any motor vehicle engines to be introduced into commerce are manufactured or assembled.

(4) On admission to any such facility referred to in paragraph (c)(3) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any aspects of such manufacture or assembly and other procedures;

(ii) To inspect and make copies of any such records, documents or designs; and

(iii) To inspect and photograph any part or aspect of any such new motor vehicle engine and component used in the assembly thereof that are reasonably related to the purpose of his entry.

(5) Any EPA Enforcement Officer shall be furnished by those in charge of a facility being inspected with such reasonable assistance as he may request to help him discharge any function listed in this paragraph. Each applicant for or recipient of certification is required to cause those in charge of a facility operated for its benefit to furnish such reasonable assistance without charge to EPA whether or not the applicant controls the facility.

(6) The duty to admit or cause to be admitted any EPA Enforcement Officer applies whether or not the applicant owns or controls the facility in question and applies both to domestic and to foreign manufacturers and facilities. EPA will not attempt to make any inspections which it has been informed that local law forbids. However, if local law makes it impossible to do what is necessary to insure the accuracy of data generated at a facility, no informed judgment that an engine is certifiable or is covered by a certificate can properly be based on that data. It is the responsibility of the manufacturer to locate its testing and manufacturing facilities in jurisdictions where this situation will not arise.

(7) For purposes of this paragraph:

(i) "Presentation of credentials" shall mean display of the document designating a person as an EPA Enforcement Officer.

(ii) Where engine, or component storage areas or facilities are concerned, "operating hours" shall mean all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(iii) Where facilities or areas other than those covered by paragraph (c)(7)(ii) of this section are concerned, "operating hours" shall mean all times during which an assembly line is in operation or all during which testing, maintenance, service accumulation, pro-

duction or compilation of records, or any other procedure or activity related to certification testing, to translation of engine designs from the test stage to the production stage, or to engine manufacture or assembly is being carried out in a facility.

(iv) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpretation and translation services, the making available on request of personnel of the facility being inspected during their working hours to inform EPA Enforcement Officer of how the facility operates and to answer his questions, and the performance on request of emissions tests on any engine which is being, has been, or will be used for certification testing. Such tests shall be nondestructive, but may require appropriate service accumulation. A manufacturer may be compelled to cause the personal appearance of any employee at such a facility before an EPA Enforcement Officer by written request for his appearance, signed by the Assistant Administrator for Enforcement and General Counsel, served on the manufacturer. Any such employee who has been instructed by the manufacturer to appear, will be entitled to be accompanied, represented, and advised by counsel. No counsel who accompanies, represents, or advised an employee compelled to appear may accompany, represent, or advise any other person in the investigation.

(v) Any entry without 24 hour prior written or oral notification to the affected manufacturer shall be authorized in writing by the Assistant Administrator for Enforcement and General Counsel.

§ 85.874–1 Smoke exhaust emission standards for 1974 and later model year engines.

(a) (1) The opacity of smoke emissions from new diesel engines subject to this subpart shall not exceed:

(i) 20 percent during the acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (a)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in § 85.874–9 through § 85.874–18 and measured and calculated in accordance with those procedures.

(b)—(c) [Reserved]

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in acordance with test procedures prescribed in § 85.874–9 through § 85.874–18, to ascertain that such test engines meet the requirements of paragraph (a) of this section.

§ 85.874–2 Application for certification.

(a) An application for a certificate of conformity to the regulations applicable to any new motor vehicle engine shall be made to the Administrator by the manufacturer and shall be kept current and accurate by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1) Identification and description of the engines covered by the application and a description of their emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test engine.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the engines for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4) A description of the proposed service accumulation procedure for durability testing.

(5) A statement of recommended maintenance and procedures necessary to assure that the engines covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(6) At the option of the manufacturer, the proposed composition of the emission data and durability data test fleet.

(c) Complete copies of the application, and of any amendments thereto, and all notifications under §§ 85.874–32, 33, and 34 shall be submitted in such multiple copies as the Administrator may require.

§ 85.874–3 Approval of application for certification; test fleet selections.

(a) After a review of the application for certification and any other information which the Administrator may require, the Administrator may approve the application and select a test fleet in accordance with § 85.874–5.

(b) The Administrator may disapprove in whole or in part an application for certification for reasons including incompleteness, inaccuracy, inappropriate proposed service accumulation procedures, test equipment, or fuel, and incorporation of defeat devices on engines described by the application.

(c) Where any part of an application is rejected, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection. Within 30 days following receipt of such notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after the review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 85.805 with respect to such issue.

§ 85.874–4 Required data.

The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information:

(a) Durability data on such engines tested in accordance with the applicable test procedures of this subpart, in such numbers as therein specified, which will show the performance of the systems installed on or incorporated in the engine for extended operation, as well as a record of all maintenance and servicing performed on the test engines after starting the zero-hour test.

(b) Emission data on such engines tested in accordance with the applicable emission test procedures of this subpart and in such numbers as therein specified, which will show their emissions after 0 hours and 125 hours of operation.

(c) A statement that engines for which certification is requested conform to the requirements in § 85.804(b) and that the descriptions of tests performed to ascertain compliance with the general standards in § 85.804(b) and the data derived from such tests are available to the Administrator upon request.

(d) A statement that the test engines, with respect to which data are submitted to demonstrate compliance with § 85.874–1 are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification, and that on the basis of such tests the engines conform to the requirements of the regulations in this subpart. If such statements cannot be made with respect to any engine tested, the engine shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test engine was not as described in the application for certification or was not tested in accordance with applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the engine does not meet the applicable standards. The provisions of § 85.874–30(b) shall then be followed.

§ 85.874–5 Test engines.

(a) (1) The engines covered by the application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii) The dimension from the centerline of the crankshaft to the centerline of the camshaft.

(iii) The dimension from the centerline of the crankshaft to the top of the cylinder block head face.

(iv) The cylinder block configuration (air cooled or water cooled; L–6, 90° V–8, etc.).

(v) The location of intake and exhaust valves and the valve sizes (within a ⅛-inch range on the valve head diameter).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(3) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The bore and stroke.

(ii) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center position.

(iii) The intake manifold induction port size and configuration.

(iv) The exhaust manifold port size and configuration.

(v) The intake and exhaust valve sizes.

(vi) The fuel system.

(vii) The camshaft timing and ignition timing characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a) (2) and (3) of this section, the Administrator will establish families for those engines based upon the features most related to their emission characteristics.

(b) Emission data engines:

(1) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(2) Engines of each engine family will be divided into groups based upon exhaust emission control system. One engine of each engine-system combination shall be run for smoke emission data as prescribed in § 85.874–7(a). Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine system combination, then one military engine shall be also selected. The engine with the highest fuel feed per stroke will usually be selected.

(3) The Administrator may select a maximum of one additional engine within each engine system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system, fuel system, compression ratio, rated speed, rated horsepower, peak torque speed and peak torque.

(c) Durability data engines:

(1) One engine from each engine-system combination shall be tested as prescribed in § 85.874–7(b). Within each combination the engine which features the highest fuel feed per stroke, primarily at rated speed and secondarily at the speed of maximum rated torque, will usually be selected for durability testing. In the case where more than one engine in an engine-system combination has the highest fuel feed per stroke, the engine with the highest maximum rated horsepower will usually be selected for durability testing. If an engine system combination includes both military and nonmilitary engines, then the nonmilitary engine with the highest maximum rated horsepower will usually be selected for durability testing.

(2) A manufacturer may elect to operate and test additional engines to represent any engine-system combination. The additional engines must be of the same model and fuel system as the engine selected in accordance with the provisions of paragraph (c)(1) of this section. Notice of an intent to test additional engines shall be given to the Administrator not later than 30 days following notification of the test fleet selection. Deterioration factors calculated for each engine-system combination shall be applied separately to military and nonmilitary engines within the same engine system combination.

(d) Any maufacturer whose projected sales of new motor vehicle engines subject to this subpart for the 1974 model year is less than 200 engines may request a reduction in the number of test engines determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure.

(e) In lieu of testing an emission data or durability data engine selected under paragraph (b) or (c) of this section and submitting data therefor, a manufacturer may, with the prior written approval of the Administrator, submit data on a similar engine for which certification has previously been obtained.

(f) For purposes of testing under § 85.874–7(g), the Administrator may require additional emission data engines and durability data engines identical in all material respects to engines selected in accordance with paragraphs (b) and (c) of this section: *Provided*, That the number of engines selected shall not increase the size of either the emission data fleet or the durability data fleet by more than 20 percent or one engine, whichever is greater.

§ 85.874–6 Maintenance.

(a)(1) Scheduled maintenance may be performed on durability engines only under the following provisions:

(i) One major engine servicing to manufacturer's specifications may be performed prior to 875 hours (±8 hours) of scheduled dynamometer operation provided such maintenance is requested in the application for certification and is specified in the maintenance instructions which will be furnished to the ultimate purchaser of the motor vehicle in which the engine, which is represented by the test engine, is installed. (For equivalent dynamometer hours, engine hours, and mileage intervals, see § 85.802(a)(26).) A scheduled major servicing shall be restricted to paragraph (a)(1)(i) (A) through (G) of this section and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by the customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(A) Low idle speed;

(B) Drive belt tension;

(C) Engine bolt torque;

(D) Valve lash;

(E) Injector timing;

(F) Injector assemblies;

(G) Governor settings.

(ii) Normal engine servicing such as engine oil change, and oil filter, fuel filter, and air filter cleaning or replacement will be allowed at manufacturer's recommended intervals. If approved in advance by the Administrator, the maintenance for these items may differ from that specified in the manufacturer's maintenance instructions.

(iii) Readjustment of the engine low idle speed may be performed once during the first 125-hours of engine operation.

(2) Unscheduled maintenance may be performed on durability engines, except as provided in paragraph (a)(5)(i) of this section, only under the following provisions:

(i) Injectors may be changed, in addition to replacement at major engine service, if a persistent misfire is detected.

(ii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (a)(1) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(3)–(4) [Reserved]

(5) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability engines shall be performed only with the advance approval of the Administrator.

(i) In the case of unscheduled maintenance such approval will be given if the Administrator:

(A) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the engine unrepresentative of engines in use, and does not require direct access to the combustion chamber, except for fuel injection component, or removable prechamber removal or replacement; and

(B) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfire, engine stall, overheating, fluid leakage,

loss of oil pressure, excessive fuel consumption or excessive power loss.

(ii) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (a)(5)(i)(A).

(iii) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on engines in use.

(6) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the engine unrepresentative of engines in use, the engine shall not be used as a durability engine.

(b)(1) Scheduled maintenance on emission data engines is limited to the adjustment of idle speed once before the 125-hour test point, provided the idle speed is outside the manufacturer's specifications required to be shown on the engine label (see § 85.874–35(a)(4)(v)).

(2) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, servicing, or replacement shall be performed only with the advance approval of the Administrator.

(c) [Reserved]

(d)(1) Complete emission tests (see §§ 85.874–9 through 85.874–17) are required, unless waived by the Administrator, before and after:

(i) Scheduled maintenance approved for durability engines.

(ii) Unscheduled maintenance which may reasonably be expected to affect emissions.

(2) The tests before and after scheduled maintenance, which are performed on durability engines prior to 117 hours, are waived. The test before scheduled maintenance, which is performed on durability engines after 117 hours and prior to 133 hours, is waived. The after-maintenance test must be run and the results used in the deterioration factor calculation in accordance with § 85.874–28(c)(1)(i)(B) or (C).

(3) The idle speed reset and any scheduled maintenance on the emission-data engine shall be performed prior to the 125-hour test. The before-maintenance and after-maintenance tests associated with idle speed reset and scheduled maintenance on the emission-data engine are waived.

(4) Test data required by this paragraph shall be air posted to the Administrator with 72 hours of test completion (or delivered within 5 working days), along with a complete record of all pertinent maintenance.

(5) When unscheduled maintenance is approved, a preliminary engineering report, unless waived by the Administrator, shall be air posted within 24 hours (or delivered within 5 working days). A final engineering report shall be delivered or air posted within ten working days after the completion of the emission tests. The Administrator may approve an extension of the time requirements for the final engineering report.

(6) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 85.874–4.

(e) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or engine malfunction (e.g., misfire, stall).

(f) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and

(1) Are used in conjunction with scheduled maintenance on such components,

(2) Are used subsequent to the identification of an engine failure or malfunction, as provided in paragraph (a)(5)(i) of this section for durability engines or paragraph (b) of this section for emission-data engines, or

(3) Unless specifically authorized by the Administrator.

§ 85.874–7 Service accumulation and emission measurements.

The procedures set forth in this section describe the service accumulation that shall be accomplished on each test engine and when tests are to be conducted.

(a)(1) Emission data engines: Each engine shall be operated with all emission control systems installed and operating on a dynamometer for 125 hours. Exhaust emission tests shall be conducted at zero and 125 hours of operation.

(2) Durability data engines: Each engine shall be operated on a dynamometer for 1,000 hours. Exhaust emission measurements, as prescribed, shall be made at zero-hours and at each 125-hour interval.

(b) A break-in procedure, not to exceed 20 hours, may be run if approved in writing in advance by the Administrator. This procedure would be run after the zero-hour test, and the hours accumulated would not be counted as part of the service accumulation.

(c) Before service accumulation can begin, the following criteria must be met. Failure to comply with these requirements shall invalidate all test data submitted for an engine.

(1) Each engine shall produce at least 95 percent of the maximum rated horsepower, corrected to rating conditions, at 95 to 100 percent of the rated speed.

(2) The fuel rate at maximum horsepower shall be within manufacturer's specifications.

(3) The zero-hour test data shall be provided to the Administrator and the engine shall be made available for such testing under § 85.874–29 as the Administrator may require.

(d) During service accumulation, hours can be credited toward the required service accumulation hours when the following criteria are met. If these criteria cannot be met, engine operation shall be discontinued and the Administrator shall be notified immediately. (Adjustments to the fuel rate can be approved under the provisions of § 85.874–6.)

(1) Each engine shall produce at least 95 percent of the maximum horsepower, at 95 to 100 percent of the rated speed, observed during zero-hour testing. Horsepower values shall be corrected to the rating conditions.

(2) The engine shall be operated at 75 percent of the inlet and exhaust restrictions specified in § 85.874–12 except that the tolerance shall be ±3 inches of water and ±0.5 inches of Hg respectively.

(e) During each emission test the inlet and exhaust restrictions shall be as specified in § 85.874–12.

(f) Tests, other than zero-hour tests, may be conducted within eight (8) hours of the nominal test point.

(g)(1) The results of each emission test shall be air posted to the Administrator within 72 hours of test completion (or delivered within five working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests (not to exceed three valid tests) at any test point, the number of tests must be the same at each point. The data obtained from all valid tests shall be used in the calculation of the deterioration factor. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within five working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 85.874–4. Where the Administrator conducts a test on a durability engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(2) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E 29–67.

(h) Once a manufacturer begins to operate an emission data or durability data engine, as indicated by compliance with paragraph (c) of this section, he shall continue to run the engine to 125 hours or 1,000 hours, respectively, and the data from the engine shall be used in the calculations under § 85.874–19. Discontinuation of an engine shall be allowed only with the prior written consent of the Administrator.

(i)(1) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases, the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(2) The test procedures (§ 85.874–9 through § 85.874–18) will be followed by

the Administrator. The Administrator will test the engines at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(3) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(j) Emission testing of any type with respect to any certification engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

§ 85.874–8 Special test procedures.

(a) The Administrator may prescribe test procedures, other than those set forth in this subpart, for any motor vehicle engine which he determines is not susceptible to satisfactory testing by the procedures set forth herein.

§ 85.874–9 Test procedures.

The procedures described in this and subsequent sections will be the test program to determine the conformity of engines with the standard set forth in § 85.874–1.

(a) The test consists of a prescribed sequence of engine operating conditions on an engine dynamometer with continuous examination of the exhaust gases. The test is applicable equally to controlled engines equipped with means for preventing, controlling, or eliminating smoke emissions and to uncontrolled engines.

(b) The test is designed to determine the opacity of smoke in exhaust emissions during those engine operating conditions which tend to promote smoke from diesel-powered vehicles.

(c) The test procedure begins with a warm engine which is then run through preloading and preconditioning operation. After an idling period, the engine is operated through acceleration and lugging modes during which smoke emission measurements are made to compare with the standards. The engine is then returned to the idle condition and the acceleration and lugging modes are repeated. Three sequences of acceleration and lugging constitute the full set of operating conditions for smoke emission measurement.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 85.874–6.

§ 85.874–10 Diesel fuel specifications.

(a) The diesel fuels employed shall be clean and bright, with pour and cloud points adequate for operability. The fuels may contain nonmetallic additives as follows: cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(b) Fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emission testing. The grade of fuel recommended by the engine manufacturer, commercially designated as "Type 1–D" or "Type 2–D," shall be used.

Item	ASTM test method No.	Type 1–D	Type 2–D
Cetane	D 613	48–54	42–50
Distillation range	D 86		
IBP, ° F		330–390	340–400
10 percent point, ° F		370–430	400–460
50 percent point, ° F		410–480	470–540
90 percent point, ° F		460–520	550–610
EP, ° F		500–560	580–660
Gravity, ° API	D 287	40–44	33–37
Total sulfur, percent	D 129 or D 2622	0.05–0.20	0.2–0.5
Hydrocarbon composition	D 1139		
Aromatics, percent		8–15	27 (Min.)
Paraffins, Naphthenes, Olefins		Remainder	Remainder
Flash point, ° F (Min.)	D 93	120	130
Viscosity, centistokes	D 445	1.6–2.0	2.0–3.2

(c) Fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of fuel recommended by the engine manufacturer, commercially designated as "Type 1–D" or "Type 2–D," shall be used.

Item	ASTM test method No.	Type 1–D	Type 2–D
Cetane	D 613	48–54	42–55
Distillation range	D 86		
IBP, ° F		330–390	340–410
10 percent point, ° F		370–430	400–470
50 percent point, ° F		410–480	470–540
90 percent point, ° F		460–520	550–610
EP, ° F		500–560	580–660
Gravity, ° API	D 287	40–44	33–40
Total sulfur, percent	D 129 or D 2622	0.05–0.20	0.2–0.5
Flash point, ° F (Min.)	D 93	120	130
Viscosity, centistokes	D 445	1.6–2.0	2.0–3.2

(d) The type fuel, including additive and other specifications, used under paragraphs (b) and (c) of this section shall be reported in accordance with § 85.874–2(b)(3).

§ 85.874–11 Dynamometer operation cycle for smoke emission tests.

(a) The following sequence of operations shall be performed during engine dynamometer testing of smoke emissions, starting with the dynamometer preloading determined and the engine preconditioned (§ 85.874–16(c)).

(1) *Idle mode.* The engine is caused to idle for 5 to 5.5 minutes at the manufacturer's recommended low idle speed. The dynamometer controls shall be set to provide minimum load by turning the load switch to the "off" position or by adjusting the controls to the minimum load position.

(2) *Acceleration mode.* (i) The engine speed shall be increased to 200±50 r.p.m. above the manufacturer's recommended low idle speed within 3 seconds.

(ii) Immediately upon completion of the mode specified in paragraph (a)(2)(i) of this section, the throttle shall be moved rapidly to, and held in, the fully-open position. The inertia of the engine and the dynamometer, or alternately a preselected dynamometer load, shall be used to control the acceleration of the engine so that the speed increases to 85 percent of the rated speed in 5±1.5 seconds. This acceleration shall be linear within 100 r.p.m. as specified in § 85.874–17(c).

(iii) After the engine reaches the speed required in paragraph (a)(2)(ii) of this section, but before the speed exceeds 90 percent of the rated speed, the throttle shall be moved rapidly to, and held in, the fully-closed position. Immediately after the throttle is closed, the preselected load required to perform the acceleration in paragraph (a)(2)(iv) of this section shall be applied.

(iv) When the engine decelerates to the maximum torque speed or 60 percent of rated speed (within 50 r.p.m.), whichever is higher, the throttle shall be moved rapidly to, and held in, the fully-open position. The preselected dynamometer load which was applied during the preceding transition period shall be used to control the acceleration of the engine so that the speed increases to at least 95 percent of the rated speed in 10±2 seconds.

(3) *Lugging mode.* (i) Immediately upon completion of the preceding acceleration mode, the dynamometer controls shall be adjusted to permit the engine to develop maximum horsepower at rated speed. This transition period shall be 50 to 60 seconds in duration. During the last ten seconds of this period, the engine speed shall be maintained within 50 r.p.m. of the rated speed, and the power (corrected, if necessary, to rating conditions) shall be no less than 95 percent of the maximum horsepower developed during zero-hour testing.

(ii) With the throttle remaining in the fully-open position, the dynamometer

controls shall be adjusted gradually so that the engine speed is reduced to the maximum torque speed or to 60 percent of the rated speed (within 50 r.p.m.), whichever is higher. This lugging operation shall be performed smoothly over a period of 35±5 seconds. The rate of slowing of the engine shall be linear, within 100 r.p.m. as specified in § 85.874–17(c).

(4) *Engine unloading.* Immediately upon completion of the preceding lugging mode, the dynamometer and engine shall be returned to the idle condition described in paragraph (a)(1) of this section.

(b) The procedures described in paragraphs (a)(1) through (a)(4) of this section shall be repeated until three consecutive valid cycles have been completed. If three valid cycles have not been completed after a total of six consecutive cycles have been run, the engine shall be preconditioned by operation at maximum horsepower at rated speed for 10 minutes before the test sequence is repeated.

§ 85.874–12 Dynamometer and engine equipment.

The following equipment shall be used for smoke emission testing of engines on engine dynamometers.

(a) An engine dynamometer with adequate characteristics to perform the test cycle described in § 85.874–10.

(b) An engine cooling system having sufficient capacity to maintain the engine at normal operating temperatures during conduct of the prescribed engine tests.

(c) A noninsulated exhaust system extending 15±5 feet from the exhaust manifold, or the crossover junction in the case of Vee engines, and presenting an exhaust back pressure within ±0.2 inch Hg. of the upper limit at maximum rated horsepower, as established by the engine manufacturer in his sales and service literature for vehicle application. A conventional automotive muffler of a size and type commonly used with the engine being tested shall be employed in the exhaust system during smoke emission testing. The terminal 2 feet of the exhaust pipe shall be circular cross section and be free of elbows and bends. The end of the pipe shall be cut off squarely. The terminal 2 feet of the exhaust pipe shall have a diameter in accordance with the engine being tested, as specified below:

Maximum rated horsepower:	*Exhaust pipe diameter (inches)*
Less than 101	2
101–200	3
201–300	4
301 or more	5

(d) An engine air inlet system presenting an air inlet restriction within ±1 inch of water of the upper limit for the engine operating condition which results in maximum air flow, as established by the engine manufacturer in his sales and service literature, for the engine being tested.

§ 85.874–13 Smoke measurement system.

(a) *Schematic drawing.* The following figure (fig. I874–1) is a schematic drawing of the optical system of the light extinction meter.

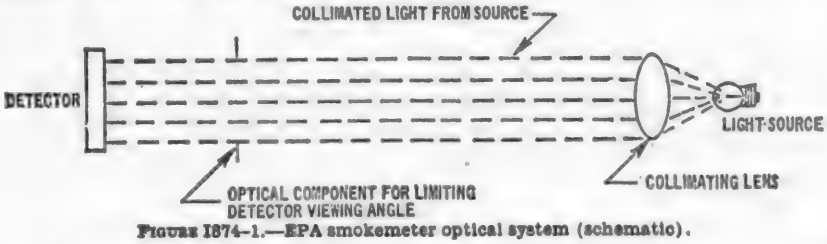

FIGURE I874–1.—EPA smokemeter optical system (schematic).

(b) *Equipment.* The following equipment shall be used in the system:

(1) Adapter—the smokemeter optical unit may be mounted on a fixed or movable frame. The normal unrestricted shape of the exhaust plume shall not be modified by the adapter, the meter, or any ventilation system used to remove the exhaust from the test site.

(2) Smokemeter (light extinction meter)—continuous recording, full-flow light obscuration meter. It shall be positioned near the end of the exhaust pipe so that a built-in light beam traverses the exhaust smoke plume which issues from the pipe at right angles to the axis of the plume. The light source is an incandescent lamp operated at a constant voltage of not less than 15 percent of the manufacturer's specified voltage. The lamp output is collimated to a beam with a nominal diameter of 1.125 inches. The angle of divergence of the collimated beam shall be within 4° included angle. A light detector, directly opposed to the light source, measures the amount of light blocked by the smoke in the exhaust. The detector sensitivity is restricted to the visual range and comparable to that of the human eye. A collimating tube with apertures equal to the beam diameter is attached to the detector. It restricts the viewing angle of the detector to within 16° included angle. An amplified signal corresponding to the amount of light blocked is recorded continuously on a remote recorder. An air curtain across the light source and detector window assemblies may be used to minimize deposition of smoke particles on those surfaces provided that it does not measurably affect the opacity of the plume. The meter consists of two units, an optical unit and a remote control unit. Light extinction meters employing substantially identical measurement principles and producing substantially equivalent results but which employ other electronic and optical techniques may be used only after having been approved in advance by the Administrator.

(3) Recorder—a continuous recorder, with variable chart speed over a minimal range of 0.5 to 8.0 inches per minute (or equivalent) and an automatic marker indicating 1-second intervals shall be used for continuously recording the exhaust gas opacity, engine r.p.m. and throttle position. The recorder shall be equipped to indicate only when the throttle is in the fully-open or fully-closed position. The recorder scale for opacity shall be linear and calibrated to read from 0 to 100 percent opacity full scale. The opacity trace shall have a resolution within 1 percent opacity. The recorder scale for engine r.p.m. shall be linear and have a resolution of 30 r.p.m. The throttle position trace must clearly indicate when the throttle is in the fully-open and fully-closed positions. Any means other than a strip-chart recorder may be used provided it produces a permanent visual data record of quality equal to or better than that described above.

(4) The recorder used with the smokemeter shall be capable of full-scale deflection in 0.5 second or less. The smokemeter-recorder combination may be damped so that signals with a frequency higher than 10 cycles per second are attenuated. A separate low-pass electronic filter with the following performance characteristics may be installed between the smokemeter and the recorder to achieve the high-frequency attenuation.

(i) 3 decibel point—10 cycles per second.

(ii) Insertion loss-zero ±0.5 decibels.

(iii) Selectivity—12 decibels per octave above 10 cycles per second.

(iv) Attenuation—27 decibels down at 40 cycles per second minimum.

(c) *Assembling equipment.* (1) The optical unit of the smokemeter shall be mounted radially to the exhaust pipe so that the measurement will be made at right angles to the axis of the exhaust plume. The distance from the optical centerline to the exhaust pipe outlet shall be 5±1 inch. The full flow of the exhaust stream shall be centered between the source and detector apertures (or windows and lenses) and on the axis of the light beam.

(2) Power shall be supplied to the control unit of the smokemeter in time to allow at least 15 minutes for stabilization prior to testing.

§ 85.874–14 Information to be recorded.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) Date and time of day.

(c) Instrument operator.

(d) Engine operator.

(e) Engine Identification numbers—Date of manufacture—Number of hours of operation accumulated on engine—Engine family—Exhaust pipe diameter—Fuel injector type—Maximum measured fuel rate at maximum measured torque and horsepower—Air aspiration system—Low idle r.p.m.—Maxi-

mum governed r.p.m.—Maximum measured horsepower at r.p.m.—Maximum measured torque at r.p.m.—Exhaust system back pressure—Air inlet restriction.

(f) Smokemeter: Number—Zero control setting—Calibration control setting—Gain.

(g) Recorder chart: Identify zero traces—calibration traces—Idle traces—Closed throttle trace, open throttle trace—Acceleration and lug down test traces—Start and finish of each test.

(h) Ambient temperature in dynamometer testing room.

(i) Engine intake air temperature and humidity.

(j) Barometric pressure.

(k) Observed engine torque and speed during the steady-state test conditions specified in § 85.874–11(a)(3)(i).

§ 85.874–15 Instrument checks.

(a) The smokemeter shall be checked according to the following procedure prior to each test:

(1) The optical surfaces of the optical section shall be checked to verify that they are clean and free of foreign material and fingerprints.

(2) The zero control shall be adjusted under conditions of "no smoke" to give a recorder trace of zero.

(3) Calibrated neutral density filters having approximately 10, 20, and 40 percent opacity shall be employed to check the linearity of the instrument. The filter(s) shall be inserted in the light path perpendicular to the axis of the beam and adjacent to the opening from which the beam of light from the light source emanates, and the recorder response shall be noted. The nominal opacity value of the filter will be confirmed by the Administrator. Deviations in excess of 1 percent of the nominal opacity shall be corrected.

(b) The instruments for measuring and recording engine r.p.m., engine torque, air inlet restrictions, exhaust system back pressure, throttle position, etc., which are used in the tests prescribed herein, shall be calibrated in accordance with good engineering practice. Opacity filters shall be calibrated semi-annually.

§ 85.874–16 Test run.

(a) The temperature of the air supplied to the engine shall be between 68° F. and 86° F. The observed barometric pressure shall be between 28.5 inches and 31 inches Hg. Higher air temperature or lower barometric pressure may be used, if desired, but no allowance will be made for possible increased smoke emissions because of such conditions.

(b) The governor and fuel system shall have been adjusted to provide engine performance at the levels specified by the engine manufacturer for maximum rated horsepower and maximum rated torque. These specifications shall be reported in accordance with § 85.874–2(b)(3).

(c) The following steps shall be taken for each test:

(1) Start cooling system.

(2) Starting with a warmed engine, determine by experimentation the dynamometer inertia and dynamometer load required to perform the acceleration in the dynamometer cycle for smoke emission tests (§ 85.874–11(a)(2)). In a manner appropriate for the dynamometer and controls being used, arrange to conduct the acceleration mode.

(3) Install smokemeter optical unit and connect it to the recorder. Connect the engine r.p.m. and torque sensing devices to the recorder.

(4) Turn on purge air to the optical unit of the smokemeter, if purge air is used.

(5) Check and record zero and span settings of the smokemeter recorder at a chart speed of approximately 1 inch per minute. (The optical unit shall be retracted from its position about the exhaust stream if the engine is left running.)

(6) Precondition the engine by operating it for 10 minutes at maximum rated horsepower.

(7) Proceed with the sequence of smoke emission measurements on the engine dynamometer as prescribed in § 85.874–11.

(8) During the test sequence of § 85.874–11, continuously record smoke measurements, engine r.p.m., and throttle position at a minimum chart speed of 1 inch per minute during the idle mode and transitional periods and 8 inches per minute during the acceleration and lugging modes. The smokemeter zero and full scale recorder deflections may be rechecked during the idle mode of each test sequence. If either zero or full scale drift is in excess of 2 percent opacity, the smokemeter controls must be readjusted and the test must be repeated.

(9) Turn off engine.

(10) Check zero and reset if necessary and check span of the smokemeter recorder by inserting neutral density filters. If either zero or span drift is in excess of 2 percent opacity, the test results shall be invalidated.

§ 85.874–17 Chart reading.

The following procedure shall be used to analyze the recorder chart.

(a) Locate the modes specified in § 85.874–11(a)(1) through (a)(4) by applying the following starting and ending criteria.

(1) The idle mode specified in § 85.874–11(a)(1) starts when engine preconditioning or the lugging mode of a preceding cycle has been completed and ends when the engine speed is raised above the idle speed.

(2) The acceleration mode specified in § 85.874–11(a)(2)(i) starts when the preceding idle mode has been completed and ends when the throttle is in the fully open position as indicated by the throttle position trace.

(3) The acceleration mode specified in § 85.874–11(a)(2)(ii) starts when the preceding acceleration mode has been completed and ends when the engine speed reaches 85 percent of the rated speed.

(4) The transition period specified in § 85.874–11(a)(2)(iii) starts when the throttle is in the fully closed position and ceding cycle has been completed and ends when the throttle is in the fully open position as indicated by the throttle position trace.

(5) The acceleration mode specified in § 85.874–11(a)(2)(iv) starts when the preceding transition period has been completed and ends when the engine speed reaches 95 percent of the rated speed.

(6) The transition period specified in § 85.874–11(a)(3)(i) starts when the preceding acceleration mode has been completed and ends when the engine speed is 50 r.p.m. below the rated speed and the provisions of § 85.874–11(a)(3)(i) are met.

(7) The lugging mode specified in § 85.874–11(a)(3)(ii) starts when the preceding transition period has been completed and ends when the engine speed is at the maximum torque speed or at 60 percent of the rated speed, whichever is higher.

(b) Determine if the test requirements of § 85.874–11 are met be applying the following modal criteria.

(1) Idle mode as specified in § 85.874–11(a)(1):

(i) Duration: 5 to 5.5 minutes.

(ii) Speed: within specifications.

(2) Acceleration mode as specified in § 85.874–11(a)(2)(i):

(i) Duration: 3 seconds or less.

(ii) Speed increase: 200±50 r.p.m.

(iii) Throttle position: fully open until speed is at least 85 percent of the rated speed.

(3) Acceleration mode as specified in § 85.874–11(a)(2)(ii):

(i) Linearity: ±100 r.p.m. as specified in paragraph (c) of this section.

(ii) Duration: 3.5 to 6.5 seconds.

(ii) Throttle position: fully open speed is at least 85 percent of the rated speed.

(4) Transition period as specified in § 85.874–11(a)(2)(iii):

(i) Throttle position: fully closed before speed exceeds 90 percent of the rated speed.

(5) Acceleration mode as specified in § 85.874–11(a)(2)(iv):

(i) Duration: 8 to 12 seconds.

(ii) Throttle position: fully open when speed is at maximum torque speed or at 60 percent of rated speed (within 50 r.p.m.) whichever is higher.

(6) Transition period as specified in § 85.874–11(a)(3)(i):

(i) Duration: 50 to 60 seconds.

(ii) Speed during last 10 seconds: within ±50 r.p.m. of rated speed.

(iii) Corrected power during last 10 seconds: at least 95 percent of horsepower developed during zero-hour testing.

(7) Lugging mode as specified in § 85.874–11(a)(3)(ii):

(i) Linearity: ±100 r.p.m. as specified in paragraph (c) of this section.

(ii) Duration: 30 to 40 seconds.

(iii) Speed at end: maximum torque speed or 60 percent of rated speed, whichever is higher.

(c) Determine if the linearity requirements of § 85.874–11 were met by means of the following procedure.

(1) For the acceleration mode specified in § 85.874–11(a)(2)(ii), note the maximum deflection of the r.p.m. trace from a straight line drawn between the starting and ending points specified in paragraph (a)(3) of this section.

(2) For the lugging mode specified in § 85.874–11(a)(3)(ii), note the maximum deflection of the r.p.m. trace from a straight line drawn from the starting and ending points specified in paragraph (a)(7) of this section.

(3) The test results will be invalid if any deflection is greater than 100 r.p.m.

(d) Analyze the smoke trace by means of the following procedure.

(1) Starting at the beginning of the first acceleration, as defined in paragraph (a)(2) of this section and stopping at the end of the second acceleration, as defined in paragraph (a)(3) of this section, divide the smoke trace into ½-second intervals. Similarly, divide into ½-second intervals the third acceleration mode and the lugging mode as defined by paragraphs (a)(5) and (7) of this section, respectively.

(2) Determine the average smoke reading during each ½-second interval.

(3) Locate and record the 15 highest ½-second readings during the acceleration mode of each dynamometer cycle.

(4) Locate and record the five highest ½-second readings during the lugging mode of each dynamometer cycle.

(5) Examine the average ½-second values which were determined in paragraphs (d)(3) and (4) of this section and record the three highest values for each dynamometer cycle.

§ 85.874–18 Calculations.

(a) Average the 45 readings in § 85.874–17(d)(3) and designate the value as "a".

(b) Average the 15 readings in § 85.874–17(d)(4) and designate the value as "b".

(c) Average the nine readings in § 85.874–17(d)(5) and designate the value as "c".

§§ 85.874–19—85.874–27 [Reserved]

§ 85.874–28 Compliance with emission standards.

(a) The emission standards in § 85.874–1 and § 85.974–1 apply to the emissions of engines for their useful lives.

(b) Since emission control efficiency decreases with the accumulation of hours on the engine, the emission level of an engine which has accumulated 1,000 hours of dynamometer operation will be used as the basis for determining compliance with the standards.

(c) The procedure for determining compliance with emission standards in heavy duty diesel engines is as follows:

(1) Emission deterioration factors for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), the peak opacity (designated as "C"), the CO exhaust emissions, and the HC+NOx exhaust emissions shall be established separately for each engine-system combination.

(i) The applicable results to be used in determining the deterioration factors for each combination shall be:

(A) All emission data from the tests required under § 85.874–7(a)(2), except the zero-hour tests. This shall include the official test results, as determined in § 85.874–29, for all tests conducted on all durability engines of the combination selected under § 85.874–5(c) (including all engines selected to be operated by the manufacturer under § 85.874–5(c)(2)).

(B) All emission data from the tests conducted before and after the maintenance provided in § 85.874–6(a)(1)(i) if emission tests were conducted.

(C) All emission data from the tests conducted before and after maintenance provided in § 85.874–6(a)(5)(iii) if emission tests were conducted.

(ii) All applicable emission results for (A) HC+NOx, (B) CO, (C) acceleration smoke ("a"), (D) lugging smoke ("b"), and (E) peak smoke ("c") shall be plotted as a function of durability hours which shall be consistently rounded to the nearest hour. Emission data shall have two figures to the right of the decimal. The best fit straight lines, fitted by the method of least squares, shall be drawn through these data points. The interpolated 125- and 1000-hour points on each line, rounded to whole numbers in accordance with ASTM E29–67, must be within the standards specified in § 85.874–1 for smoke emissions and § 85.974–1 for gaseous emissions or the data shall not be used in the calculation of a deterioration factor, unless no applicable data points exceeded the standards.

(iii) The interpolated values shall be used to calculate a deterioration factor as follows:

Factor=Exhaust emissions (both smoke and gaseous) interpolated to 1000 hours minus the exhaust emissions interpolated to 125 hours. (Negative deterioration factors shall be considered zero).

(2) The appropriate deterioration factor, carried out to two places to the right of the decimal point, shall be added to the exhaust emission test results, carried out to two places to the right of the decimal point, for each emission data engine.

(3) The emission values to compare with the standards shall be the adjusted emission values of paragraph (c)(2) of this section rounded to whole numbers in accordance with ASTM E 29–67 for each emission data engine.

(4) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (c)(3) of this section, before any engine in that family will be certified.

§ 85.874–29 Testing by the Administrator.

(a) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(b)(1) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(2) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided*, That if the Administrator makes a determination based on testing under paragraph (a) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer: *And further provided*, that if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(3)(i) The emission data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 85.874–35(a)(4)(v)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report the Administrator will determine if the engine shall be used as an emission data engine.

(ii) If the Administrator determines that the test data developed under paragraph (b)(3)(i) of this section would cause the emission data engine to fail due to excessive 125-hour emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(A) The manufacturer may request a retest. Before the retest, the engine may be readjusted to manufacturer's specifications, as shown on the label required under § 85.874–35, if these adjustments were made incorrectly prior to the first test, and other maintenance or repairs may be performed in accordance with § 85.874–6. All work on the engine shall be done at such location and under such conditions as the Administrator may prescribe.

(B) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission data engine.

(4) If sufficient durability data are not available at the time of any emission test

conducted under paragraph (a) of this section to enable the Administrator to determine whether a test engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (b)(3)(ii) (A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

§ 85.874–30 Certification.

(a)(1) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 85.806(c), and any other pertinent data or information, the Administrator determines that a test engine(s) meets the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such engine(s) except in cases covered by paragraph (c) of this section.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle engine covered by the certificate will meet the requirements of the Act and of this subpart. Each such certificate shall contain the following language:

This certificate covers only those new motor vehicle engines which conform, in all material respects, to the design specifications that applied to those engines described in the application for certification and which are produced during the ____ model year production period of the said manufacturer, as defined in 40 CFR 85.802(a)(3).

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 85.806(c) which concern either the engine certified, or any production engine covered by this certificate, or any production engine which when completed will be claimed to be covered by this certificate. Failure to comply with all the requirements of § 85.806(c) with respect to any such engine may lead to revocation or suspension of this certificate as specified in 40 CFR 85.874–30(c). It is also a term of this certificate that this certificate may be revoked or suspended for the other reasons stated in 85.874–30(c).

(b)(1) The Administrator will determine whether an engine covered by the application complies with applicable standards by observing the following relationships:

(i) A test engine selected under § 85.874–5(b)(2) shall represent all engines in the same engine system combination.

(ii) A test engine selected under § 85.874–5(b)(3) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(iii) A test engine selected under § 85.874–5(c)(1) shall represent all engines of the same engine-system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the engines belonging to an engine family all of which comply with applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 85.874–29, data or information derived from any inspection carried out under § 85.806(c), or any other pertinent data or information, the Administrator determines that one or more test engines of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer, and shall include a statement specifying the manufacturer's objections to the Administrator's determination, and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 85.805 with respect to such issue.

(4) The manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 85.–805, or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under § 85.–874–32.) The Administrator will then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed, or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, shall then be operated and tested in accordance with applicable test procedures.

(5) If the manufacturer does not request a hearing or present the required data under subparagraph (4) of this paragraph, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification engine(s) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such engine(s) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof; or

(ii) The manufacturer renders inaccurate or invalid any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act or of this subpart with respect to such engine; or

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 85.806(c) to any facility or portion thereof which contains any of the following:

(A) The engine, or

(B) Any components used or considered for use in its modification or build-up into a certification engine, or

(C) Any production engine which is or will be claimed by the manufacturer to be covered by the certificate, or

(D) Any step in the construction of an engine described in (C) of this subdivision, or

(E) Any records, documents, reports or histories required by this part to be kept concerning any of the above.

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 85.806(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraph (c)(1)(i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(4) In any case in which certification of an engine is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1)(iii), or (c)(1)(iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 85.806(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the engine in question was not involved in the violation to a degree that would warrant withholding, denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (c)(1)(iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 85.805 hereof,

(ii) Extend no further than to forbid the introduction into commerce of engines previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid ab initio.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 85.804. If the Administrator finds after a review of the request and supporting data, that the request raises a substantial factual issue, he shall grant the request with respect to such issue.

§ 85.874–31 Separate certification.

Where possible, a manufacturer should include in a single application for certification all engines for which certification is required. A manufacturer may, however, choose to apply separately for certification of part of his product line. The selection of test engines and the computation of test results will be determined separately for each application.

§ 85.874–32 Addition of an engine after certification.

(a) If a manufacturer proposes to add to his product line an engine of the same engine-system combination as engines previously certified but which was not described in the application for certification when the test engine(s) representing other engines of that combination was certified, he shall notify the Administrator. Such notification shall be in advance of the addition unless the manufacturer elects to follow the procedure described in § 85.874–34. This notification shall include a full description of the engine to be added.

(b) The Administrator may require the manufacturer to perform such tests on the test engine(s) representing the engine to be added which would have been required if the engine had been included in the original application for certification.

(c) If, after a review of the test reports and data submitted by the manufacturer, and data derived from any testing conducted under § 85.874–29, the Administrator determines that the test engine(s) meets all applicable standards, the appropriate certificate will be amended accordingly. If the Administrator determines that the test engine(s) does not meet applicable standards, he will proceed under § 85.874–30(b).

§ 85.874–33 Changes to an engine covered by certification.

(a) The manufacturer shall notify the Administrator of any change in production engines in respect to any of the parameters listed in § 85.874–5(a)(3) or § 85.874–5(b)(3), giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 85.874–34.

(b) Based upon the description of the change, and data derived from such testing as the Administrator may require or conduct, the Administrator will determine whether the engine, as modified, would still be covered by the certificate of conformity then in effect.

(c) If the Administrator determines that the outstanding certificate would cover the modified engines, he will notify the manufacturer in writing. Except as provided in § 85.874–34, the change may not be put into effect prior to the manufacturer's receiving this notification. If the Administrator determines that the modified engines would not be covered by the certificate then in effect, then the modified engines shall be treated as additions to the product line subject to § 85.874–32.

§ 85.874–34 Alternative procedure for notification of additions and changes.

(a) A manufacturer may, in lieu of notifying the Administrator in advance of an addition of an engine under § 85.874–32 or a change in an engine under § 85.874–33, notify him concurrently with the making of the change if the manufacturer believes the addition or change will not require any testing under the appropriate section. Upon notification to the Administrator, the manufacturer may proceed to put the addition or change into effect.

(b) The manufacturer may continue to produce engines as described in the notification to the Administrator for a maximum of 30 days, unless the Administrator grants an extension in writing. This period may be shortened by a notification in accordance with paragraph (c) of this section.

(c) If the Administrator determines, based upon a description of the addition or change, that no test data will be required, he will notify the manufacturer in writing of the acceptability of the addition or change. If the Administrator determines that test data will be required, he will notify the manufacturer to rescind the change within 5 days of receipt of the notification. The Administrator will then proceed as in § 85.874–32 (b) and (c), or § 85.874–33 (b) and (c) as appropriate.

(d) Election to produce engines under this section will be deemed to be a consent to recall all engines which the Administrator determines under § 85.874–32 (c) do not meet applicable standards, and to cause such nonconformity to be remedied at no expense to the owner.

§ 85.874–35 Labeling.

(a) (1) The manufacturer of any heavy duty diesel engine subject to the standards prescribed in § 85.874–1 shall, at the time of manufacture, affix a permanent, legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such engines available for sale to the public and covered by a certificate of conformity under § 85.874–30(a).

(2) A plastic or metal label shall be welded, bonded, or otherwise permanently attached to the engine in a position in which it will be readily visible after installation in the vehicle.

(3) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(4) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(i) The label heading: Engine Exhaust Emission Control Information;

(ii) Full corporate name and trademark of manufacturer;

(iii) Engine family identification and model;

(iv) Date of engine manufacture (month and year);

(v) Engine specification:

Advertised hp _____ @ _____ r.p.m.
Fuel rate @ advertised hp_____ mm.³/stroke.
Valve lash _____ (inches)
Initial injection timing (if adjustable)_____
_____.

(The information applicable to each engine is to be inserted on the appropriate line.)

(vi) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations applicable to Diesel heavy duty engines.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such engine conforms to any applicable State emission standards for new motor vehicle engines or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the engine.

(c) The label may be made up of one or more pieces provided that all pieces are permanently attached to the same engine or vehicle part as applicable.

§ 85.874–36 [Reserved]

§ 85.874–37 Production engines.

(a) Any manufacturer obtaining certification under this subpart shall supply to the Administrator, upon his request, a reasonable number of production engines selected by the Administrator which are representative of the engines, emission control systems, fuel systems, and transmissions offered and typical of production models available for sale under the certificate. These engines shall be supplied for testing at such time and place and for such reasonable periods as the Administrator may require. Engines supplied under this paragraph may be required to be mounted in chassis and appropriately equipped for operation on a chassis dynamometer.

(b) Any manufacturer obtaining certification under this part shall notify the Administrator, on a quarterly basis, of the number of engines of each engine family-engine displacement-exhaust emission control system-fuel system combination produced for sale in the United States during the preceding quarter.

§ 85.874–38 Maintenance instructions.

(a) The manufacturer shall furnish or cause to be furnished to the purchaser of each new motor vehicle engine subject to the standards prescribed in § 85.874–1, written instructions for the maintenance

and use of the engine by the purchaser as may be reasonable and necessary to assure the proper functioning of emission control systems.

(1) Such instructions shall be provided for those engine components listed in Appendix VI to this part (and for any other components) to the extent that maintenance of these components is necessary to assure the proper functioning of emission control systems.

(2) Such instructions shall be in clear, and to the extent practicable, nontechnical language.

(3) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 85.874–6(a). Scheduled maintenance in addition to that performed on the durability engine under § 85.874–6(a) may be recommended for reasons such as to offset the effects of operating conditions which differ from the dynamometer durability cycle or to increase the life of the engine beyond 1000 hours (or its equivalent). The instructions may schedule maintenance on a calendar time basis, mileage basis, engine service time basis, or combinations of each.

(b) The maintenance instructions required by this section shall contain a general description of the documentation which the manufacturer will require from the ultimate purchaser or any subsequent purchaser as evidence of compliance with the instructions.

§ 85.874–39 Submission of maintenance instructions.

(a) The manufacturer shall provide to the Administrator no later than the time of the submission required by § 85.874–4, a copy of the maintenance instructions which the manufacturer proposes to supply to the ultimate purchaser in accordance with § 85.874–38(a). The Administrator will review such instructions to determine whether they are reasonable and necessary to assure the proper functioning of the engine's emission control systems. The Administrator will notify the manufacturer of his determination whether such instructions are reasonable and necessary to assure the proper functioning of the emission control systems.

(b) Any revision to the maintenance instructions which will affect emissions shall be supplied to the Administrator at least 30 days before being supplied to the ultimate purchaser unless the Administrator consents to a lesser period of time.

Subpart J—Engine Exhaust Gaseous Emission Regulations for New Diesel Heavy Duty Engines

§ 85.901 General applicability.

The provisions of this subpart are applicable to new diesel heavy duty engines beginning with the 1974 model year.

§ 85.902 Definitions.

The requirements of this section are set forth in § 85.802.

§ 85.903 Abbreviations.

The requirements of this section are set forth in § 85.803.

§ 85.904 General standards; increase in emissions; unsafe conditions.

The requirements of this section are set forth in § 85.804.

§ 85.905 Hearings on certificaiton.

The requirements of this section are set forth in § 85.805.

§ 85.906 Maintenance of records; submittal of information; right of entry.

The requirements of this section are set forth in § 85.806.

§ 85.974–1 Exhaust gaseous emission standards for 1974 and later model year engines.

(a)(1) Exhaust gaseous emissions from new heavy duty diesel engines shall not exceed:

(i) *Hydrocarbons plus oxides of nitrogen* (as NO_2). 16 grams per brake horsepower hour.

(ii) *Carbon monoxide*. 40 grams per brake horsepower hour.

(2) The standards set forth in paragraph (a) of this section refer to exhaust gaseous emissions generated under the conditions set forth in § 85.974–9 through § 85.974–18 and measured and calculated in accordance with those procedures.

(b) [Reserved]

(c) [Reserved]

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with test procedures prescribed in § 85.974–9 through § 85.974–18 to ascertain that such test engines meet the requirements of paragraph (a) of this section.

§ 85.974–2 Application for certification.

The requirements of this section are set forth in § 85.874–2.

§ 85.974–3 Approval of application for certification; test fleet selections.

The requirements of this section are set forth in § 85.874–3.

§ 85.974–4 Required data.

The requirements of this section are set forth in § 85.874–4.

§ 85.974–5 Test engines.

The test engines selected for testing under § 85.874–5 shall be used as the test engines for testing under this subpart. At each test point, each engine shall be tested in accordance with § 85.974–9 through § 85.974–18 and § 85.874–9 through § 85.874–18. At each test point, either the complete gaseous emission test or the complete smoke test may be conducted first.

§ 85.974–6 Maintenance.

The requirements of this section are set forth in § 85.874–6.

§ 85.974–7 Service accumulation and emission measurements.

The requirements of this section are set forth in § 85.874–7.

§ 85.974–8 Special test procedures.

The requirements of this section are set forth in § 85.874–8.

§ 85.974–9 Test procedures.

The test procedures described in this and subsequent sections will be the test program to determine the conformity of engines with the standards set forth in § 85.974–1.

(a) The test procedure begins with a warm engine and consists of a prescribed sequence of engine operating conditions on an engine dynamometer with continuous examination of the exhaust gases.

(b) The test is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide and oxides of nitrogen when an engine is operated through a cycle which consists of three idle modes and five power modes at each of two speeds which span the typical operating range of diesel engines. The procedure requires the determination of the concentration of each pollutant, the exhaust flow and the power output during each mode. The measured values are weighted and used to calculate the grams of each pollutant emitted per brake-horsepower hour.

(c) When an engine is tested for exhaust emissions or is operated for durability testing on an engine dynamometer, the complete engine shall be tested with all standard accessories which might reasonably be expected to influence emissions to the atmosphere installed and functioning.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 85.974–6.

(e) [Reserved]

(f) [Reserved]

(g) All emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all test procedures in this subpart.

§ 85.974–10 Diesel fuel specifications.

The requirements of this section are set forth in § 85.874–10.

§ 85.974–11 Dynamometer procedure.

(a) The following 13 mode cycle shall be followed in dynamometer operation tests of heavy-duty diesel engines:

Mode No.	Engine speed	Percent load
1	Low idle	0
2	Intermediate	2
3	do	25
4	do	50
5	do	75
6	do	100
7	Low idle	0
8	Rated	100
9	do	75
10	do	50
11	do	25
12	do	2
13	Low idle	0

(b) During each mode the specified speed shall be held to within 50 r.p.m. and the specified torque shall be held to

within 2 percent of the maximum torque at the test speed. For example, the torque for mode 4 shall be between 48 and 52 percent of the maximum torque measured at the intermediate speed.

(c) If the operating conditions specified in paragraph (b) of this section for modes 3, 4, 5, 9, 10, and 11 cannot be maintained, the Administrator may authorize deviations from the specified load conditions. Such deviations shall not exceed 10 percent of the maximum torque at the test speed. The minimum deviations, above and below the specified load, necessary for stable operation shall be determined by the manufacturer and approved by the Administrator prior to the test run specified in § 85.974–16. Emission tests shall be performed at each of the approved load settings, one above and one below the operating conditions specified in paragraph (b) of this section. The emission values obtained shall be calculated in accordance with § 85.974–18 except that the weighting factor specified in § 85.974–18(e)(2) shall be 0.04.

§ 85.974–12 Dynamometer and engine equipment.

The requirements of this section are set forth in § 85.874–12.

§ 85.974–13 Sampling and analytical methods.

(a) The determination of the carbon monoxide and nitric oxide concentrations shall be accomplished using sampling and analysis components as specified in Sections 2.1 and 2.2 of the SAE Recommended Practice No. J177 titled, "Measurement of Carbon Dioxide, Carbon Monoxide and Oxides of Nitrogen in Diesel Exhaust," dated June 1970. Other sampling and analysis components may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(b) The determination of the hydrocarbon concentrations shall be accomplished using sampling and analysis components as specified in sections 2.1 and 2.2 of SAE Recommended Practice No. J215 titled, "Continuous Hydrocarbon Analysis of Diesel Exhaust," dated November 1970.

(c) The determination of the intake airflow or exhaust flow shall be accomplished using SAE Recommended Practice No. J244 titled, "The Measurement of Intake or Exhaust Flow in Diesel Engines," dated May 1971.

§ 85.974–14 Information.

The following information shall be recorded:

(a) Test number.
(b) Date and time of day.
(c) Instrument operator.
(d) Engine operator.
(e) Engine identification numbers—date of manufacture—number of hours of operation accumulated on engine—engine family—exhaust pipe diameter—fuel injector type—low idle r.p.m., governed speed, maximum power and torque speeds—maximum horsepower and torque—fuel consumption at maximum power and torque—air aspiration system—exhaust system back pressure—air inlet restriction.
(f) All pertinent instrument information such as tuning—gain—serial numbers—detector numbers—range.
(g) Recorder chart. Identify zero traces—calibration or span traces—emission concentration traces for each test mode—start and finish of each test.
(h) Ambient temperature in dynamometer testing room.
(i) Engine intake air temperature and humidity for each mode.
(j) Barometric pressure.
(k) Observed engine torque for each mode.
(l) Intake airflow or exhaust flow for each mode.
(m) Fuel flow and temperature for each mode.

§ 85.974–15 Calibration and instrument checks.

Calibration and instrument checks shall be performed according to section 2.3.1 of SAE Recommended Practice No. J177, dated June 1970, and sections 3 and 7 of SAE Recommended Practice No. J215, dated November 1970, except that the instrument zeros need not be checked after each analysis but as necessary to maintain test validity. Calibration and checks of other instruments used for the test shall be performed as necessary according to good practice.

§ 85.974–16 Test run.

(a) The temperature of the air supplied to the engine shall be between 68° F. and 86° F. The fuel temperature at the pump inlet shall be 100° F. ±10° F. The observed barometric pressure shall be between 28.5 inches and 31 inches Hg. Higher air temperature or lower barometric pressure may be used, if desired, but no allowance shall be made for increased emissions because of such conditions.

(b) The governor and fuel system shall have been adjusted to provide engine performance at the levels specified by the engine manufacturer for maximum rated horsepower and maximum rated torque. These specifications shall be reported in accordance with § 85.974–2(b)(3).

(c) The following steps shall be taken for each test:

(1) Install instrumentation and sample probes as required.
(2) Start cooling system.
(3) Start the engine, warm it up and precondition it by running it at rated speed and maximum horsepower for 10 minutes or until all temperatures and pressures have reached equilibrium.
(4) Determine by experimentation the maximum torque at rated speed and intermediate speed to calculate the torque values for the specified test modes.
(5) Zero and span the emission analyzers on each range used during the test run.
(6) Start the test sequence of § 85.974–11. Operate the engine for 10 minutes in each mode, completing engine speed and load changes in the first minute. If a delay of more than 10 minutes occurs between the end of one mode and the start of the next mode, discontinue the sequence and repeat the test from Mode No. 1. Record the response of the analyzers on a strip chart recorder for the full 10 minutes with exhaust gas flowing through the analyzers at least during the last 5 minutes. Record the engine speed and load, intake air temperature and restriction, exhaust back pressure, fuel flow and air or exhaust flow during the last 5 minutes of each mode, making certain that the speed and load requirements of § 85.974–11(b) are met during the last minute of each mode. Fuel flow during idle or 2 percent load conditions may be determined just prior to or immediately following the dynamometer, sequence, if longer times are required for accurate measurements.
(7) Read and record any additional data as required for § 85.974–14.
(8) Check and reset the zero and span settings of the emission analyzers as required, but at least at the end of the second idle mode (mode No. 7) and at the end of the test. If a change of over 2 percent of full-scale response is observed, make necessary adjustments to the analyzers and repeat all test modes since the last zero and span check.
(9) Backflush condensate trap and replace filters as required.

§ 85.974–17 Chart reading.

(a) Locate the last 60 seconds of each mode and determine the average chart reading for HC, CO, and NO over the 1-minute period.

(b) Determine the concentration of HC, CO, NO during each mode from the average chart readings and the corresponding calibration data.

§ 85.974–18 Calculations.

The final reported test results shall be derived through the following steps:

(a) Determine the exhaust gas mass-flow rate for each mode according to the SAE Recommended Practice J244 dated May 1971.

(b) Convert the measured carbon monoxide and nitric oxide concentrations to a wet basis according to sections 4 and 5.4 of SAE Recommended Practice No. J177 (See § 85.974–13(a)).

(c) Multiply the corrected nitric oxide values by the following humidity correction factor:

$$\frac{1}{1+A(H-75)+B(T-85)}$$

Where:

$A=0.044\ (F/A)-0.0038$
$B=-0.116\ (F/A)+0.0053$
H = humidity of the inlet air in grains of water per pound of dry air.
T = Temperature of the air in °F.
F/A = Fuel-air ratio (dry air basis).

(d) Calculate the mass emissions of HC (HC_{mass}), CO (CO_{mass}), and NO_x (NO^x_{mass}) in grams per hour for each mode as follows:

(1) $HC_{mass}=0.0132\times HC_{conc}\times$ exhaust mass (lb./min.).

(2) $CO_{mass}=0.0263\times CO_{conc}\times$ exhaust mass (lb./min.).

(3) $NO^x_{mass}=0.0432\times NO_{conc}\times$ exhaust mass (lb./min.).

(e) Calculate the weighted brake horsepower and HC, CO, and NO_x mass values as follows:

(1) Multiply the average of the three idle values by a weighting factor of 0.2.

(2) Multiply the values for all of the other modes by a weighting factor of 0.08.

(f) Calculate the brake specific emissions for HC, CO, and NO_x for each set of data as follows:

$$BSHC = \frac{\Sigma(HC_{mass} \times WF)}{\Sigma(\text{Measured } BHP \times WF)}$$

$$BSCO = \frac{\Sigma(CO_{mass} \times WF)}{\Sigma(\text{Measured } BHP \times WF)}$$

$$BSNO_x = \frac{\Sigma(NO_{x\,mass} \times WF)}{\Sigma(\text{Measured } BHP \times WF)}$$

§§ 85.974–19 through 85.974–27 [Reserved]

§ 85.974–28 Compliance with emission standards.

The requirements of this section are set forth in § 85.874–28.

§ 85.974–29 Testing by the Administrator.

The requirements of this section are set forth in § 85.874–29.

§ 85.974–30 Certification.

The requirements of this section are set forth in § 85.874–30.

§ 85.974–31 Separate certification.

The requirements of this section are set forth in § 85.874–31.

§ 85.974–32 Addition of an engine after certification.

The requirements of this section are set forth in § 85.874–32.

§ 85.974–33 Changes to an engine covered by certification.

The requirements of this section are set forth in § 85.874–33.

§ 85.974–34 Alternative procedure for notification of additions and changes.

The requirements of this section are set forth in § 85.874–34.

§ 85.974–35 Labeling.

The requirements of this section are set forth in § 85.874–35.

§ 85.974–36 [Reserved]

§ 85.974–37 Production engines.

The requirements of this section are set forth in § 85.874–37.

§ 85.974–38 Maintenance instructions.

The requirements of this section are are set forth in § 85.874–38.

§ 85.974–39 Submission of maintenance instructions.

The requirements of this section are set forth in § 85–874–39.

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[FRL 389–6]

PART 85—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES

PART 86—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES: CERTIFICATION AND TEST PROCEDURES

Recodification of Motor Vehicle Emission Regulations

The Environmental Protection Agency has determined that it is advantageous to reorganize the existing motor vehicle emission regulations. Also, the need for a number of technical amendments and corrections has been identified. The reorganization and changes are set forth in this publication and are described below.

The Agency finds good cause to omit as unnecessary a notice of proposed rulemaking and public rulemaking procedure in the issuance of this recodification. The revisions standardize the test to reflect current EPA practice, correct and clarify ambiguities and remove duplicate language. All revisions made are procedural in nature and do not affect either the stringency or burden of complying with the standards.

Several reasons support this recodification, the primary one being the physical size of the present regulations. Over the past several years three new light duty subparts (light duty Diesel vehicle, light duty truck and light duty Diesel truck) have been added to the regulations. These subparts are duplications of the light duty vehicle subpart with only minor changes in procedures and standards. In addition, a great deal of the administrative language is common to all seven subparts (light and heavy duty). This duplication serves no useful function and results in additional printing expense.

All seven prior subparts use the same language to describe the administration of the regulations and the certification program. The test procedures for each subpart are the major difference between subparts and, as was previously stated, the four light duty test sequences are quite similar. Existing regulations will be used through the 1976 model year, and beginning with the 1977 model year the recodified regulations in 40 CFR Part 86 will be used. To take advantage of the similarities of the current subparts, the motor vehicle certification and test procedure regulations have been structured as follows:

Part	Subpart	Contents
85	A	Emission regulations for 1976 and earlier model year new gasoline-fueled light duty vehicles.
	B	Emission regulations for 1976 and earlier model year new diesel powered light duty vehicles.
	C	Emission regulations for 1976 and earlier model year new gasoline-fueled light duty trucks.
	D	Emission regulations for 1976 model year new diesel powered light duty trucks.
	E to G	Reserved.
	H	Emission regulations for 1976 and earlier model year new gasoline-fueled heavy duty engines.
	I	Engine smoke exhaust emission regulations for 1976 and earlier model year new diesel heavy duty engines.
	J	Engine exhaust gaseous emission regulations for 1976 and earlier model year new diesel heavy duty engines.
86	A	Emission regulations for 1977 and later model year new light duty vehicles, light duty trucks and heavy duty engines; general provisions.
	B	Emission regulations for 1977 and later model year new light duty vehicles and light duty trucks; test procedures.
	C to G	Reserved.
	H	Emission regulations for 1977 and later model year new gasoline-fueled heavy duty engines; test procedures.
	I	Emission regulations for 1977 and later model year new diesel heavy duty engines; smoke exhaust test procedures.
	J	Emission regulations for 1977 and later model year new diesel heavy duty engines, gaseous exhaust test procedures.

Several techniques have been used to effectuate the reorganization. In most instances the language of the several subparts was identical, and no changes were necessary. However, it was necessary to use the phrase "vehicles or engines" (or equivalent) in a number of places to include both classes of emission sources. Finally, a relatively few cases required dividing a section into two or more parts each referring to a particular type or class of emission source.

A table is included to provide a cross reference from the new Part 86 regulations to the old format. Since the new format follows the same basic order as the old format, a reverse table is not necessary.

While the substance of the regulations has not been modified, the recodification combines the general provisions into a new Subpart A of Part 86 with the test procedures set forth in Subpart B, Part 86 (1977 and later model year new light duty vehicles and light duty trucks); Subpart H, Part 86 (1977 and later model year new gasoline-fueled heavy duty engines); Subpart I, Part 86 (1977 and later model year new Diesel heavy duty engines, smoke exhaust); and Subpart J, Part 86 (1977 and later model year new Diesel heavy duty engines, gaseous exhaust).

The subparts have been reorganized to combine similar language and function. The reorganization reflects the usual division of labor into separate groups responsible for administering the cerification procedures, the test procedures for light duty vehicles, the test procedures for heavy duty gasoline engines and the test procedures for Diesel heavy duty engines.

In keeping with the EPA general policy to gradually embody the SI system of units, these units have been incorporated when previously published rules such as the high altitude regulations have incorporated SI units.

Specific changes in the regulations found necessary for recodification are as follows:

Section	Change	Reason
	Part 85	
Pt. 85 Subpt. A Title	Subpt. A is now only applicable through the 1976 model year.	Subpts. A and B of pt. 86 have been added to apply to 1977 and later model year vehicles.
85.001	do	Do.
85.077-1	Delete	Language has been added to subpts. A and B of pt. 86.
85.077-4		
85.077-5		
85.077-6		
85.077-7		
85.077-10		
85.077-30		
85.077-35		
85.077-38		
85.078-1		
Pt. 85 Subpt. B Title	Subpt. B is now only applicable through the 1976 model year.	Subpts A and B of pt. 86 have been added to apply to 1977 and later model year vehicles.
85.101	do	Do.
85.177-1	Delete	Language has been added to subpts. A and B of pt. 86.
85.177-4		
85.177-5		
85.177-6		
85.177-7		
85.177-30		
85.177-35		
85.177-38		
85.178-1		
Pt. 85 Subpt. C Title	Subpt. C is now only applicable through the 1976 model year.	Subpts. A and B of pt. 86 have been added to apply to 1977 and later model year vehicles.
85.201	do	Do.
85.277-1	Delete	Language has been added to subpts. A and B of pt. 86.
85.277-4		
85.277-5		
85.277-6		
85.277-7		
85.277-10		
85.277-30		
85.277-35		
85.277-38		
Pt. 85 Subpt. D Title	Subpt. D is now only applicable through the 1976 model year.	Subpts. A and B of pt. 86 have been added to apply to 1977 and later model year vehicles.
85.301	do	Do.
85.377-1	Delete	Language has been added to subpts. A and B of pt. 86.
85.377-4		
85.377-5		
85.377-6		
85.377-7		
85.377-30		
85.377-35		
85.377-38		
Pt. 85 Subpt. H	Subpt. H is now only applicable through the 1976 model year.	Subpts. A and H of pt. 86 have been added to apply to 1977 and later model year engines.
85.701	do	Do.
Pt. 85 Subpt. I Title	Subpt. I is now only applicable through the 1976 model year.	Subpts. A and I of pt. 86 have been added to apply to 1977 and later model year engines.
85.801	do	Do.
Pt. 85 Subpt. J Title	Subpt J is now only applicable through the 1976 model year.	Subpts. A and J of pt. 86 have been added to apply to 1977 and later model year engines.
85.901	do	Do.
	Part 86	
Subpt. A	New subpart	Incorporates regulations from pt. 85 into a unified general provisions subpart.
86.077-1	The reference to motorcycles has been removed from the light duty vehicle applicability section.	The light duty vehicle definition was previously revised to exclude motorcycles making reference to motorcycles in the vehicle applicability section unnecessary.
86.077-2	This definition section applies to subpts. A, B, H, I, and J.	Eliminates duplication.
	The definition for diesel light duty vehicle is changed to be consistent with the definition for gasoline-fueled light duty vehicle.	This change was inadvertently omitted when a similar change was made to the gasoline-fueled light duty vehicle definition.
	The "motorcycle" and "off road utility vehicle" definitions are deleted.	There is no longer any reference to motorcycles or off road utility vehicles in the regulations.
	The definition of "loaded vehicle weight" is changed to apply to both light duty vehicles and light duty trucks.	The change was unintentionally omitted when the light duty truck class was created.
86.077-3	This abbreviation section applies to subpts. A, B, H, I, and J.	Eliminates duplication.
	Abbreviation of AECD is included	Unintentionally omitted from previous publication.
86.077-4	New section	Explains new numbering system and section construction.
86.077-7	Previous subpar. (a)(3) deleted	Not applicable. This subparagraph applied to the 1975 model year.
	Subpar. (c)(1)(iii) modified for heavy duty engines to include previous buildup activities.	Language concerning previous buildup activities will apply to vehicles and engines as was originally intended.
86.077-21	Subpar. (a) is modified	Necessary to fit recodified format.
86.077-24	Subpar. (a)(1) is modified to apply to both vehicles and engines. Also the qualifying phrase "throughout their useful life" now applies to heavy duty diesel engines.	Changes are necessary to recodify. Additional change to heavy duty diesel provisions was omitted from previous amendments.
	Subpar. (b)(1)(iii) is modified by designating the model year as the one for which certification is sought.	Necessary to implement recodification.

Section	Change	Reason
86.077–28	The reference to a 5,000 mile test point for diesel vehicles is changed to 4,000 miles.	Error in previous publications.
86.077–30	Par. (a)(3) added to require separate certification for the various classes of vehicles, engines, and standards.	Provision previously applied to light duty vehicles, and is necessary since regulations for the various emission sources have been combined.
86.077–37	Phrase "or injection" added	To apply to both gasoline and diesel engines.
86.077–38	Reference to "ultimate" deleted	Wording is unnecessary.
86.177–11	Par. (e)(3) modified for diesel light duty vehicles, to specify the procedure for increasing road load horsepower for testing air-conditioned vehicles.	Revision was unintentionally omitted previously when a similar change was made to the procedure for all other light duty vehicle and truck classes.
86.177–12 86.177–13 86.177–14 86.177–15	The term "throttle" has been replaced by the term "accelerator pedal".	Diesels do not have throttles. The term "accelerator pedal" is a more accurate description and applies equally to gasoline-fueled and diesel vehicles.

CROSS REFERENCE TABLE

New section No.:	Prior section No.
86.077–1	85.001
	85.101
	85.201
	85.301
	85.701
	85.801
	85.901
86.077–2	85.002
	85.102
	85.202
	85.302
	85.702
	85.802
	85.902
86.077–3	85.003
	85.103
	85.203
	85.303
	85.703
	85.803
	85.903
86.077–4	(1)
86.077–5	85.004
	85.104
	85.204
	85.304
	85.704
	85.804
	85.904
86.077–6	85.005
	85.105
	85.205
	85.305
	85.705
	85.805
	85.905
86.077–7	85.006
	85.106
	85.206
	85.306
	85.706
	85.806
	85.906
86.077–8	85.075–1
	85.076–1
	85.175–1
	85.176–1
86.077–9	85.275–1
	85.276–1
	85.376–1
	85.377–1
86.077–10	85.774–1
86.077–11	85.874–1
	85.974–1
86.077–12 through 86.077–20	(2)
86.077–21	85.075–2
	85.175–2
	85.275–2
	85.376–2
	85.774–2
	85.874–2
	85.974–2
86.077–22	85.075–3
	85.175–3
	85.275–3
	85.376–3
	85.774–3
	85.874–3
	85.974–3

New section No.:	Prior section No.
86.077–23	85.075–4
	85.175–4
	85.275–4
	85.376–4
	85.774–4
	85.874–4
	85.974–4
86.077–24	85.075–5
	85.175–5
	85.275–5
	85.376–5
	85.774–5
	85.874–5
	85.974–5
85.077–25	85.075–6
	85.175–6
	85.275–6
	85.376–6
	85.774–6
	85.874–6
	85.974–6
86.077–26	85.075–7
	85.175–7
	85.275–7
	85.376–7
	85.774–7
	85.874–7
	85.974–7
86.077–27	85.075–8
	85.175–8
	85.275–8
	85.376–8
	85.774–8
	85.874–8
	85.974–8
86.077–28	85.075–28
	85.175–28
	85.275–28
	85.376–28
	85.774–28
	85.874–28
	85.974–28
86.077–29	85.075–29
	85.175–29
	85.275–29
	85.376–29
	85.774–29
	85.874–29
	85.974–29
86.077–30	85.075–30
	85.175–30
	85.275–30
	85.376–30
	85.774–30
	85.874–30
	85.974–30
86.077–31	85.075–31
	85.175–31
	85.275–31
	85.376–31
	85.774–31
	85.874–31
	85.974–31
86.077–32	85.075–32
	85.175–32
	85.275–32
	85.376–32
	85.774–32
	85.874–32
	85.974–32

New section No.:	Prior section No.
86.077–33	85.075–33
	85.175–33
	85.275–33
	85.376–33
	85.774–33
	85.874–33
	85.974–33
86.077–34	85.075–34
	85.175–34
	85.275–34
	85.376–34
	85.774–34
	85.874–34
	85.974–34
86.077–35	85.075–35
	85.175–35
	85.275–35
	85.376–35
	85.774–35
	85.874–35
	85.974–35
86.077–36	85.075–36
	85.175–36
	85.275–36
	85.376–36
86.077–37	85.075–37
	85.175–37
	85.275–37
	85.376–37
	85.774–37
	85.874–37
	85.974–37
86.077–38	85.075–38
	85.175–38
	85.275–38
	85.376–38
	85.774–38
	85.874–38
	85.974–38
86.077–39	85.075–39
	85.175–39
	85.275–39
	85.376–39
	85.774–39
	85.874–39
	85.974–39
86.078–8	85.078–1
86.177–1	85.001
	85.101
	85.201
	85.301
86.177–2	85.002
	85.102
	85.202
	85.302
86.177–3	85.003
	85.103
	85.203
	85.303
86.177–4	(1)
86.177–5	85.075–9
	85.076–9
	85.175–9
	85.275–9
	85.376–9
86.177–6	85.075–10
	85.175–10
	85.275–10
	85.376–10
86.177–7	85.075–11
	85.076–11
	85.275–11
	85.276–11
86.177–8	85.075–12
	85.076–12
	85.175–11
	85.275–12
	85.276–12
	85.376–11
86.177–9	85.075–13
	85.275–13
86.177–10	85.075–14
	85.175–12
	85.275–14
	85.376–12

Footnotes at end of table.

New section No.:	Prior section No.
86.177–11	85. 075–15
	85. 175–13
	85. 275–15
	85. 376–13
86.177–12	85. 075–16
	85. 175–14
	85. 275–16
	85. 376–14
86.177–13	85.075–17
	85.175–15
	85.275–17
	85.376–15
86.177–14	85.075–18
	85.175–16
	85.275–18
	85.376–16
86.177–15	85.075–19
	85.175–17
	85.275–19
	85.376–17
86.177–16	85.075–20
	85.175–18
	85.275–20
	85.376–18
86.177–17	85.075–21
	85.275–21
86.177–18	85.075–22
	85.175–19
	85.275–22
	85.376–19
86.177–19	85.075–23
	85.175–20
	85.275–23
	85.376–20
86.177–20	85.075–24
	85.175–21
	85.275–24
	85.376–21
86.177–21	85.075–25
	85.175–22
	85.275–25
	85.376–22
86.177–22	85.075–26
	85.175–23
	85.275–26
	85.376–23
86.177–23	85.075–27
	85.275–27
86.777–1	85.701
86.777–2	85.702
86.777–3	85.703
86.777–4	(1)
86.777–5	85.774–9
86.777–6	85.774–10
86.777–7	85.774–11
86.777–8	85.774–12
86.777–9	85.774–13
86.777–10	85.774–14
86.777–11	85.774–15
86.777–12	Reserved
86.777–13	85.774–16
86.777–14	85.774–17
86.777–15	85.774–18
86.877–1	85.801
86.877–2	85.802
86.877–3	85.803
86.877–4	(1)
86.877–5	85.874–9
86.877–6	85.874–10
86.877–7	85.874–11
86.877–8	85.874–12
86.877–9	85.874–13
86.877–10	85.874–14
86.877–11	85.874–15
86.877–12	85.874–16
86.877–13	85.874–17
86.877–14	85.874–18
86.977–1	85.901
86.977–2	85.902
86.977–3	85.903
86.977–4	(1)
86.977–5	85.974–9
86.977–6	85.974–10
86.977–7	85.974–11
86.977–8	85.974–12
86.977–9	85.974–13
86.977–10	85.974–14
86.977–11	85.974–15
86.977–12	Reserved
86.977–13	85.974–16
86.977–14	85.974–17
86.977–15	85.974–18

[1] No corresponding prior section.
[2] Reserved.

Parts 85 and 86 of Chapter I, Title 40 of the Code of Federal Regulations are amended as follows, effective July 30, 1975.

The provisions of these parts 85 and 86 are issued under the authority of sections 202, 206, 207, 208, and 301(a) of the Clean Air Act, as amended (42 U.S.C. 1857f–1, 1857f–5, 1857f–5a, 1857f–6, 1857g (a)).

Dated: June 20, 1975.

EDWARD F. TUERK,
Acting Assistant Administrator for Air and Waste Management.

1. The title to Subpart A of Part 85 is revised to read as follows:

Subpart A—Emission Regulations for 1976 and Earlier Model Year New Gasoline-Fueled Light Duty Vehicles

2. Section 85.001 is revised to read as follows:

§ 85.001 General applicability.

The provisions of this subpart are applicable to 1976 and earlier model year new gasoline-fueled light duty vehicles.

3. The title to Subpart B of Part 85 is revised to read as follows:

Subpart B—Emission Regulations for 1976 and Earlier Model Year New Diesel Powered Light Duty Vehicles

4. Section 85.101 is revised to read as follows.

§ 85.101 General applicability.

The provisions of this subpart are applicable to 1976 and earlier model year new Diesel light duty vehicles.

5. The title to Subpart C of Part 85 is revised to read as follows:

Subpart C—Emission Regulations for 1976 and Earlier Model Year New Gasoline-Fueled Light Duty Trucks

6. Section 85.201 is revised to read as follows:

§ 85.201 General applicability.

The provisions of this subpart are applicable to 1976 and earlier model year new gasoline-fueled light duty trucks.

7. The title to Subpart D of Part 85 is revised to read as follows:

Subpart D—Emission Regulations for 1976 Model Year New Diesel Light Duty Trucks

8. Section 85.301 is revised to read as follows:

§ 85.301 General applicability.

The provisions of this subpart are applicable to 1976 model year new Diesel light duty trucks.

9. Sections 85.077–1, 85.077–4, 85.077–5, 85.077–6, 85.077–7, 85.077–10, 85.077–30, 85.077–35, 85.077–38, and 85.078–1 are deleted from subpart A.

10. Sections 85.177–1, 85.177–4, 85.177–5, 85.177–6, 85.177–7, 85.177–30, 85.177–35, 85.177–38 and 85.178–1 are deleted from subpart B.

11. Sections 85.277–1, 85.277–4, 85.277–5, 85.277–6, 85.277–7, 85.277–10, 85.277–30, 85.277–35 and 85.277–38 are deleted from subpart C.

12. Sections 85.377–1, 85.377–4, 85.377–5, 85.377–6, 85.377–7, 85.377–30, 85.377–35 and 85.377–38 are deleted from subpart D.

13. A new Subpart A is added to Part 86 and reads as follows:

Subpart A—General Provisions for Emission Regulations for 1977 and Later Model Year New Light Duty Vehicles, 1977 and Later Model Year Light Duty Trucks for 1977 and Later Model Year New Heavy Duty Engines

Sec.

86.077–1	General applicability.
86.077–2	Definitions.
86.077–3	Abbreviations.
86.077–4	Section numbering; construction.
86.077–5	General standards; increase in emissions; unsafe conditions.
86.077–6	Hearings on certification.
86.077–7	Maintenance of records; submittal of information; right of entry.
86.077–8	Emission standards for 1977 light duty vehicles.
86.077–9	Emission standards for 1977 light duty trucks.
86.077–10	Emission standards for 1977 gasoline-fuel heavy duty engines.
86.077–11	Emission standards for 1977 Diesel heavy duty engines.
86.077–12—86.077–20	[Reserved]
86.077–21	Application for certification.
86.077–22	Approval of application for certification; test fleet selections.
86.077–23	Required data.
86.077–24	Test vehicles and engines.
86.077–25	Maintenance.
86.077–26	Mileage and service accumulation; emission measurements.
86.077–27	Special test procedures.
86.077–28	Compliance with emission standards.
86.077–29	Testing by the Administrator.
86.077–30	Certification.
86.077–31	Separate certification.
86.077–32	Addition of a vehicle or engine after certification.
86.077–33	Changes to a vehicle or engine covered by certification.
86.077–34	Alternative procedure for notification of additions and changes.
86.077–35	Labeling.
86.077–36	Submission of vehicle identification numbers.
86.077–37	Production vehicles and engines.
86.077–38	Maintenance instructions.
86.077–39	Submission of maintenance instructions.
86.078–8	Emission standards for 1978 light duty vehicles.

AUTHORITY: Secs. 202, 206, 207, 208 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 1857f–1, 1857f–5, 1857f–5a, 1857f–6 1857g(a)).

Subpart A—General Provisions for Emission Regulations for 1977 and Later Model Year New Light Duty Vehicles, 1977 and Later Model Year New Light Duty Trucks and for 1977 and Later Model Year New Heavy Duty Engines

§ 86.077–1 General applicability.

The provisions of this subpart are applicable to 1977 and later model year new light duty vehicles, 1977 and later model year new light duty trucks and 1977 and later model year new heavy duty engines.

§ 86.077–2 Definitions.

(a) The definitions in this section apply to this subpart and also to subparts B, H, I and J.

(b) As used in this subpart all terms not defined herein shall have the meaning given them in the Act:

"Act" means Part A of title II of the Clean Air Act, 42 U.S.C. 1857 f–1 through f–7, as amended by Pub. L. 91–604.

"Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

"Auxiliary Emission Control Device (AECD)" means any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system.

"Calibrating gas" means a gas of known concentration which is used to establish the response curve of an analyzer.

"Crankcase emissions" means airborne substances emitted to the atmosphere from any portion of the engine crankcase ventilation or lubrication systems.

"Defeat Device" means an AECD that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal urban vehicle operation and use, unless (1) such conditions are substantially included in the Federal emission test procedure, or (2) the need for the AECD is justified in terms of protecting the vehicle against damage or accident, or (3) the AECD does not go beyond the requirements of engine starting.

"Diurnal breathing loss" means fuel evaporative emissions as a result of the daily range in temperature to which the fuel system is exposed.

"Engine family" means the basic classification unit of a manufacturer's product line used for the purpose of test fleet selection and determined in accordance with § 86.077–24.

"Engine-system combination" means an engine family-exhaust emission control system-fuel evaporative emission control system (where applicable) combination.

"EPA Enforcement Officer" means any officer or employee of the Environmental Protection Agency so designated in writing by the Administrator (or by his designee).

"Exhaust emissions" means substances emitted to the atmosphere from any opening downstream from the exhaust port of a motor vehicle engine.

"Fuel evaporative emissions" means vaporized fuel emitted into the atmosphere from the fuel system of a motor vehicle.

"Fuel system" means the combination of fuel tank, fuel pump, fuel lines, and carburetor, or fuel injection components, and includes all fuel system vents and fuel evaporative emission control systems.

"Gross vehicle weight" means the manufacturer's gross weight rating for the individual vehicle.

"Heavy duty vehicle" means any motor vehicle either designed primarily for transportation of property and rated at more than 6,000 pounds GVW or designed primarily for transportation of persons and having a capacity of more than 12 persons.

"Heavy duty engine" means any engine which the engine manufacturer could reasonably expect to be used for motive power in a heavy duty vehicle.

"High altitude" means any elevation over 1219 meters (4000 feet).

"High altitude conditions" means a test altitude of 1585 meters (5200 feet) plus or minus 274 meters (900 feet), or equivalent observed barometric test conditions of 83.48 kPa (24.72 inches Hg), plus or minus 2.77 kPa (0.82 inches Hg).

"Hot soak loss" means fuel evaporative emissions during the 1-hour hot soak period which begins immediately after the engine is turned off.

"Intermediate speed" means the peak torque speed or 60 percent of rated speed, whichever is higher.

"Light duty truck" means any motor vehicle rated at 6,000 pounds GVW or less, which is designed primarily for purposes of transportation of property or is a derivative of such a vehicle, or is available with special features enabling off-street of off-highway operation and use.

"Light duty vehicle" means a passenger car or passenger car derivative capable of seating 12 passengers or less.

"Loaded vehicle weight" means the vehicle curb weight of a light duty vehicle plus 300 pounds.

"Maximum rated horsepower" means the maximum brake horsepower output of an engine as stated by the manufacturer in his sales and service literature and his application for certification under § 86.077–21.

"Maximum rated torque" means the maximum torque produced by an engine as stated by the manufacturer in his sales and service literature and his application for certification under § 86.077–21.

"Military engine" means any engine manufactured solely for the Department of Defense to meet military specifications.

"Model year" means the manufacturer's annual production period (as determined by the Administrator) which includes January 1 of such calendar year: *Provided*, That if the manufacturer has no annual production period, the term "model year" shall mean the calendar year.

"Rated speed" means the speed at which the manufacturer specifies the maximum rated horsepower of an engine.

"Opacity" means the fraction of a beam of light, expressed in percent, which fails to penetrate a plume of smoke.

"Oxides of nitrogen" means the sum of the nitric oxide and nitrogen dioxide contained in a gas sample as if the nitric oxide were in the form of nitrogen dioxide.

"Peak torque speed" means the speed at which an engine develops maximum torque.

"Percent load" means the fraction of the maximum available torque at a specified engine speed.

"Rated speed" means the speed at which the manufacturer specifies the maximum rated horsepower of an engine.

"Running loss" means fuel evaporative emissions resulting from an average trip in an urban area or the simulation of such a trip.

"Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed on a periodic basis to prevent part failure or vehicle (if the engine were installed in a vehicle) malfunction.

"Smoke" means the matter in the exhaust emissions which obscures the transmission of light.

"Span gas" means a gas of known concentration which is used routinely to set the output level of an analyzer.

"System" includes any motor vehicle engine modification which controls or causes the reduction of substances emitted from motor vehicles.

"Tank fuel volume" means the volume of fuel in the fuel tank, prescribed to be 40 percent of nominal tank capacity rounded to the nearest whole U.S. gallon.

"Throttle" means the mechanical linkage which either directly or indirectly controls the fuel flow to the engine.

"Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction.

"Useful life" means:

(1) For light duty vehicles and light duty trucks a period of use of 5 years or 50,000 miles, whichever first occurs.

(2) For heavy duty gasoline engines a period of use of 5 years or of 50,000 miles of vehicle operation or 1,500 hours of engine operation (or an equivalent period of 1,500 hours of dynamometer operation), whichever occurs first.

(3) For heavy duty Diesel engines a period of use of 5 years or 100,000 miles of vehicle operation or 3,000 hours of engine operation (or an equivalent period of 1,000 hours of dynamometer operation), whichever first occurs.

"Vehicle curb weight" means the actual or the manufacturer's estimated weight of the vehicle in operational status with all standard equipment, and weight of fuel at nominal tank capacity, and the weight of optional equipment computed in accordance with § 86.077–24.

"Zero (0) hours" means that point after normal assembly line operations and adjustments are completed and before one (1) additional operating hour has been accumulated.

"Zero (0) miles" means that point after initial engine starting (not to exceed 10 miles of vehicle operation, or one hour of engine operation) at which normal assembly line operations and adjustments are completed.

§ 86.077–3 Abbreviations.

(a) The abbreviations in this section apply to this subpart and also to subparts B, H, I and J.

(b) The abbreviations used in this subpart have the following meanings in both capital and lower case:

Accel.—Acceleration.
AECD—Auxiliary Emission Control Device.
API—American Petroleum Institute.
ASTM—American Society for Testing and Materials.
BHP—Brake horsepower.
BSCO—Brake specific carbon monoxide.
BSHC—Brake specific hydrocarbons.
BSNOx—Brake specific oxides of nitrogen.
C—Centigrade.
C.f.h.—Cubic feet per hour.
CO2—Carbon dioxide.
CO—Carbon monoxide.
Conc.—Concentration.
C.f.m.—Cubic feet per minute.
CT—Closed Throttle.
Cu. in.—Cubic inch(es).
Decel.—Deceleration.
EP—End point.
Evap.—Evaporated.
F.—Fahrenheit.
FL—Full load.
Gal.—U.S. gallon(s).
Gm.—Grams.
GVW—Gross Vehicle Weight.
H2O—Water.
HC—Hydrocarbon(s).
Hg—Mercury.
Hi.—High.
Hp.—Horsepower.
Hr.—Hour.
IBP—Initial boiling point.
ID—Internal diameter.
kPa—Kilopascal(s).
Lb.—Pound(s).
Lib.-ft.—Pound-feet.
Max.—Maximum.
Min.—Minimum.
Min.—Minute(s).
ML—Milliliter(s).
M.P.H.—Miles per hour.
mm.—Millimeter(s).
Mv.—Millivolt(s).
N2—Nitrogen.
NDIR—Nondispersive infrared.
NO—Nitric oxide.
NO2—Nitrogen dioxide.
NOx—Oxides of nitrogen.
No.—Number.
Pb.—Lead.
P.p.m.—Parts per million by volume.
P.s.i.—Pounds per square inch.
P.s.i.g.—Pounds per square inch gauge.
PTA—Part throttle escalation.
PTD—Part throttle deceleration.
R—Rankin.
R.p.m.—Revolutions per minute.
R.v.p.—Reid vapor pressure.
S.A.E.—Society of Automotive Engineers.
Sec.—Second(s).
Sp.—Speed.
SS—Stainless steel.
TEL—Tetraethyl lead.
TML—Tetramethyl lead.
V.—Volts.
Vs.—Versus.
WF—Weighting factor.
WOT—Wide open throttle.
Wt.—Weight.
'—Feet.
''—Inches.
°—Degrees.
%—Percent.
Σ—Summation.

§ 86.077–4 Section numbering; construction.

(a) *Section numbering.* The model year of initial applicability is indicated by the last two digits of the 5 digit group. A section remains in effect for subsequent model years until it is superseded. The number following the hyphen designates what previous section is replaced by a future regulation.

EXAMPLES: Section 86.077–6 applies to the 1977 and subsequent model years until superseded. If a § 86.080–6 is promulgated it would take effect with the 1980 model year; § 86.077–6 would not apply after the 1979 model year. Section 86.077–10 would be replaced by § 86.078–10 beginning with the 1978 model year.

(b) *Construction.* Except where indicated, the language in this subpart applies to both vehicles and engines. In many instances language referring to engines is enclosed in parentheses and immediately follows the language discussing vehicles.

§ 86.077–5 General standards; increase in emissions; unsafe conditions.

(a)(1) Every new motor vehicle (or new motor vehicle engine) manufactured for sale, sold, offered for sale, introduced or delivered for introduction into commerce, or imported into the United States for sale or resale which is subject to any of the standards prescribed in this subpart shall be covered by a certificate of conformity issued pursuant to §§ 86.077–21 through 86.077–23 and §§ 86.077–29 through 86.077–34 of this subpart.

(2) No heavy duty vehicle manufacturer shall take any of the actions specified in section 203(a)(1) of the Act with respect to any gasoline-fueled or Diesel heavy duty vehicle which uses an engine which has not been certified as meeting applicable standards. Such manufacturer shall provide to the Administrator prior to the beginning of each model year a statement signed by an authorized representative which includes the following information:

(i) A description of the vehicles which will be produced subject to this section;

(ii) Identification of the engines used in the vehicles;

(iii) Projected sales data on each vehicle engine combination;

(iv) A statement that the engines will not be modified by the vehicle manufacturer or a detailed specification of any changes which will be made. Changes made solely for the purpose of mounting an engine in a vehicle need not be included.

(v) A statement that the engine maintenance instruction supplied by the engine manufacturer, in compliance with § 86.077–38, will be furnished to the ultimate purchaser. If these maintenance instructions are modified, a detailed description of the modifications and a justification for each must be provided to the Administrator for review. The Administrator will notify the manufacturer of the determination whether the modified instructions are reasonable and necessary to assure proper functioning of the emission control system.

(b)(1) Any system installed on or incorporated in a new motor vehicle (or new motor vehicle engine) to enable such vehicle (or engine) to conform to standards imposed by this subpart.

(i) Shall not in its operation or function cause the emission into the ambient air of any noxious or toxic substance that would not be emitted in the operation of such vehicle (or engine) without such system, except as specifically permitted by regulation; and

(ii) Shall not in its operation, function, or malfunction result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(2) Every manufacturer of new motor vehicles (or new motor vehicle engines) subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicles (or motor vehicle engines) in accordance with good engineering practice to ascertain that such test vehicles (or test engines) will meet the requirements of this section for the useful life of the vehicle (or engine).

§ 86.077–6 Hearings on certification.

(a)(1) After granting a request for a hearing under §§ 86.077–22 and 86.077–30 the Administrator will designate a Presiding Officer for the hearing.

(2) The General Counsel will represent the Environmental Protection Agency in any hearing under this section.

(3) If a time and place for the hearing has not been fixed by the Administrator under §§ 86.077–22 or 86.077–30, the hearing shall be held as soon as practicable at a time and place fixed by the Administrator or by the Presiding Officer.

(4) In the case of any hearing requested pursuant to § 86.077–30(c)(5)(i), the Administrator may in his discretion direct that all argument and presentation of evidence be concluded within such fixed period not less than 30 days as he may establish from the date that the first written offer of a hearing is made to the manufacturer. To expedite proceedings, the Administrator may direct that the decision of the Presiding Officer (who may, but need not be the Administrator himself) shall be the final EPA decision.

(b)(1) Upon his appointment pursuant to paragraph (a) of this section, the Presiding Officer will establish a hearing file. The file shall consist of the notice issued by the Administrator under §§ 86.077–22 or 86.077–30 together with any accompanying material, the request for a hearing and the supporting data submitted therewith and all documents relating to the request for certification and all documents submitted therewith, and correspondence and other data material to the hearing.

(2) The appeal file will be available for inspection by the applicant at the office of the Presiding Officer.

(c) An applicant may appear in person, or may be represented by counsel or by any other duly authorized representative.

(d)(1) The Presiding Officer upon the request of any party, or in his discretion, may arrange for a prehearing conference at a time and place specified by him to consider the following:

(i) Simplification of the issues;

(ii) Stipulations, admissions of fact, and the introduction of documents;

(iii) Limitation of the number of expert witnesses;

(iv) Possibility of agreement disposing of all or any of the issues in dispute;

(v) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

(2) The results of the conference shall be reduced to writing by the Presiding Officer and made part of the record.

(e)(1) Hearings shall be conducted by the Presiding Officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to the exclusion by the Presiding Officer of irrelevant, immaterial and repetitious evidence.

(2) Witnesses will not be required to testify under oath. However, the Presiding Officer shall call to the attention of witnesses that their statements may be subject to the provisions of title 18 U.S.C. 1001 which imposes penalties for knowingly making false statements or representations, or using false documents in any matter within the jurisdiction of any department or agency of the United States.

(3) Any witness may be examined or cross-examined by the Presiding Officer, the parties, or their representatives.

(4) Hearings shall be reported verbatim. Copies of transcripts of proceedings may be purchased by the applicant from the reporter.

(5) All written statements, charts, tabulations, and similar data offered in evidence at the hearing shall, upon a showing satsfactory to the Presiding Officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute a part of the record.

(6) Oral argument may be permitted in the discretion of the Presiding Officer and shall be reported as part of the record unless otherwise ordered by him.

(f)(1) The Presiding Officer shall make an initial decision which shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made a part of the record. The initial decision shall become the decision of the Administrator without further proceedings unless there is an appeal to the Administrator or motion for review by the Administrator within 20 days of the date the initial decision was filed.

(2) On appeal from or review of the initial decision the Administrator shall have all the powers which he would have in making the initial decision including the discretion to require or allow briefs, oral argument, the taking of additional evidence or the remanding to the Presiding Officer for additional proceedings. The decision by the Administrator shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law or discretion presented on the appeal or considered in the review.

§ 86.077–7 Maintenance of records; submittal of information; right of entry.

(a) The manufacturer of any new motor vehicle (or new motor vehicle engine) subject to any of the standards or procedures prescribed in this subpart shall establish, maintain and retain the following adequately organized and indexed records.

(1) *General records.* (i)(A) Identification and description of all certification vehicles (or certification engines) for which testing is required under this subpart. (B) A description of all emission control systems which are installed on or incorporated in each certification vehicle (or certification engine). (C) A description of all procedures used to test each such certification vehicle (or certification engine). (ii) A properly filed application for certification, following the format prescribed by the US EPA for the appropriate model year, fulfills each of the requirements of this paragraph (a)(1).

(2) *Individual records.* (i) A brief history of each motor vehicle (or motor vehicle engine) used for certification under this subpart in the form of a separate booklet or other document for each separate vehicle (or each separate engine) in which shall be recorded:

(A) In the case where a current production engine is modified for use in a certification vehicle (or as a certification engine), a description of the process by which the engine was selected and of the modifications made, giving specifically the place of modification and installation of the engine into the certification vehicle and the person(s) in charge of modification and installation, as applicable. In the case where the engine for a certification vehicle (or certification engine) is not derived from a current production engine, a general description of the build up of the engine (e.g., experimental heads were cast and machined according to supplied drawings, etc.) giving specifically the place of engine assembly and installation into a certification vehicle and the person(s) in charge of engine assembly and installation, as applicable. In both cases above, a description of the origin and selection process for the carburetor, distributor, fuel system components, fuel injection components, emission control system components, smoke exhaust emission control system components, and exhaust aftertreatment device, as applicable, shall be included. The required descriptions shall specify the steps taken to assure that the certification vehicle (or certification engine) with respect to its engine, drive train, fuel system, emission control system components, exhaust aftertreatment device, smoke exhaust emission control system components, vehicle weight or any other device or component, as applicable, that can reasonably be expected to influence exhaust or evaporative emissions, as applicable, will be representative of production vehicle (or engines) and that either all components and/or vehicle (or engine) construction processes, component inspection and selection techniques, and assembly techniques employed in constructing such vehicles (or engines) are reasonably likely to be implemented for production vehicles (or engines) or that they are as closely analogous as practicable to planned construction and assembly processes.

(B) A complete record of all emission tests performed under subparts B, H, I and J, as applicable (except tests performed by EPA directly), including all individual worksheets and/or other documentation relating to each such test, or exact copies thereof, the date, time, purpose, and location of each test; the number of miles accumulated on the vehicle (or the number of hours accumulated on the engine) when the tests began and ended, and the names of supervisory personnel responsible for the conduct of the tests.

(C) The date and times of each mileage (or service) accumulation run, listing both the mileage (or number of operating hours) accumulated and the name of each driver or each operator of the automatic mileage accumulation device (or dynamometer operator).

(D) If used, the record of any devices employed to record the speed and/or mileage in relationship to time of the test vehicle (or engine RPM, and/or horsepower and/or torque in relationship to engine operating time).

(E) A record and description of all maintenance and other servicing performed, giving the date and time of the maintenance or service, the reason for it, the person authorizing it, and the names of supervisory personnel responsible for the conduct of the maintenance or service. The description shall indicate whether or not EPA specifically consented to the work and, if EPA did not shall list the provision of this part which authorizes its performance.

(F) A record and description of each test performed to diagnose engine or emissions control system performance, giving the date and time of the tests, the reason for it, the person authorizing it, and the names of supervisory personnel responsible for the conduct of the test.

(G) The dates and times that the vehicle (or engine) was idle in storage, and in transit or transport.

(H) A brief description of any significant events affecting the vehicle (or engine) during any time in the period covered by the history not described by an entry under one of the previous headings including such extraordinary events as vehicle accidents (or accidents involving the engine) or driver speeding citations or warnings (or dynamometer runaway).

(ii) Each such history shall be started on the date that the first of any of the selection or buildup activities in paragraph (a)(2)(i)(A) of this section occurred with respect to the certification vehicle (or engine), shall be updated each time the operational status of the vehicle (or engine) changes or additional work is done on it, and shall be kept in a designated location.

(3) All records required to be maintained under this subpart shall be retained by the manufacturer for a period of six (6) years after issuance of

all certificates of conformity to which they relate. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending on the record retention procedures of the manufacturer, provided, that in every case all the information contained in the hard copy shall be retained.

(b) The manufacturer of any new motor vehicle (or new motor vehicle engine) subject to any of the standards prescribed in this subpart shall submit to the Administrator at the time of issuance by the manufacturer copies of all instructions or explanations regarding the use, repair, adjustment, maintenance, or testing of such vehicle (or engine) relevant to the control of crankcase, exhaust or evaporative emissions, as applicable, issued by the manufacturer for use by other manufacturers, assembly plants, distributors, dealers, and ultimate purchasers; provided, that any material not translated into the English language need not be submitted unless specifically requested by the Administrator.

(c)(1) Any manufacturer who has applied for certification of a new motor vehicle (or new motor vehicle engine) subject to certification test under this subpart shall admit or cause to be admitted any EPA Enforcement Officer during operating hours on presentation of credentials to any of the following:

(i) Any facility where any such tests or any procedures or activities connected with such tests are or were performed.

(ii) Any facility where any new motor vehicle (or new motor vehicle engine) which is being, was, or is to be tested is present.

(iii) Any facility where any construction process or assembly process used in the modification or build up of such a vehicle (or engine) into a certification vehicle (or certification engine) is taking place or has taken place.

(iv) Any facility where any record or other document relating to any of the above is located.

(2) Upon admission to any facility referred to in paragraph (c)(1) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any part or aspect of such procedures, activities, and testing facilities, including, but not limited to, monitoring vehicle (or engine) preconditioning, emissions tests and mileage (or service) accumulation, maintenance, and vehicle soak and storage procedures (or engine storage procedures); and to verify correlation or calibration of test equipment;

(ii) To inspect and make copies of any such records, designs, or other documents; and

(iii) To inspect and/or photograph any part or aspect of any such certification vehicle (or certification engine) and any components to be used in the construction thereof.

(3) In order to allow the Administrator to determine whether or not production motor vehicles (or production motor vehicle engines) conform in all material respects to the design specifications which applied to those vehicles (or engines) described in the application for certification for which a certificate of conformity has been issued and to standards prescribed under section 202 of the Act, any manufacturer shall admit any EPA Enforcement Officer on presentation of credentials to both:

(i) Any facility where any document, design, or procedure relating to the translation of the design and construction of engines and emission related components described in the application for certification or used for certification testing into production vehicles (or production engines) is located or carried on; and

(ii) Any facility where any motor vehicles (or motor vehicle engine) to be introduced into commerce are manufactured or assembled.

(4) On admission to any such facility referred to in paragraph (c)(3) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any aspects of such manufacture or assembly and other procedures;

(ii) To inspect and make copies of any such records, documents or designs; and

(iii) To inspect and photograph any part or aspect of any such new motor vehicles (or new motor vehicle engines) and any component used in the assembly thereof that are reasonably related to the purpose of his entry.

(5) Any EPA Enforcement Officer shall be furnished by those in charge of a facility being inspected with such reasonable assistance as he may request to help him discharge any function listed in this paragraph. Each applicant for or recipient of certification is required to cause those in charge of a facility operated for its benefit to furnish such reasonable assistance without charge to EPA whether or not the applicant controls the facility.

(6) The duty to admit or cause to be admitted any EPA Enforcement Officer applies whether or not the applicant owns or controls the facility in question and applies both to domestic and to foreign manufacturers and facilities. EPA will not attempt to make any inspections which it has been informed that local law forbids. However, if local law makes it impossible to do what is necessary to insure the accuracy of data generated at a facility, no informed judgment that a vehicle or engine is certifiable or is covered by a certificate can properly be based on that data. It is the responsibility of the manufacturer to locate its testing and manufacturing facilities in jurisdictions where this situation will not arise.

(7) For purposes of this paragraph:

(i) "Presentation of credentials" shall mean display of the document designating a person as an EPA Enforcement Officer.

(ii) Where vehicle, component, or engine storage areas or facilities are concerned, "operating hours" shall mean all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(iii) Where facilities or areas other than those covered by paragraph (c)(7)(ii) of this section are concerned, "operating hours" shall mean all times during which an assembly line is in operation or all times during which testing, maintenance, mileage (or service) accumulation, production or compilation of records, or any other procedure or activity related to certification testing, to translation of designs from the test stage to the production stage, or to vehicle (or engine) manufacture or assembly is being carried out in a facility.

(iv) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpretation and translation services, the making available on request of personnel of the facility being inspected during their working hours to inform the EPA Enforcement Officer of how the facility operates and to answer his questions, and the performance on request of emissions tests on any vehicle (or engine) which is being, has been, or will be used for certification testing. Such tests shall be nondestructive, but may require appropriate mileage (or service) accumulation. A manufacturer may be compelled to cause the personal appearance of any employee at such a facility before an EPA Enforcement Officer by written request for his appearance, signed by the Assistant Administrator for Enforcement and General Counsel, served on the manufacturer. Any such employee who has been instructed by the manufacturer to appear will be entitled to be accompanied, represented, and advised by counsel. No counsel who accompanies, represents, or advises an employee compelled to appear may accompany, represent, or advise any other person in the investigation.

(v) Any entry without 24 hour prior written or oral notification to the affected manufacturer shall be authorized in writing by the Assistant Administrator for Enforcement and General Counsel.

§ 86.077–8 Emission standards for 1977 light duty vehicles.

(a)(1) Exhaust emissions from 1977 model year light duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 grams per vehicle mile.

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 2.0 grams per vehicle mile.

(2) For those manufacturers who have been granted a suspension of the standards specified in paragraph (a)(1) the following standards for exhaust emissions from 1977 model year light duty vehicles shall apply;

(i) *Hydrocarbons.* 1.5 grams per vehicle mile.

(ii) *Carbon monoxide.* 15 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 2.0 grams per vehicle mile.

(3) The standards set forth in paragraphs (a)(1) and (a)(2) of this section refer to the exhaust emitted over a driving schedule as set forth in subpart B and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from gasoline-fueled light duty vehicles shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in subpart B and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1977 model gasoline fueled light duty vehicle.

§ 86.077–9 Emission standards for 1977 light duty trucks.

(a)(1) Exhaust emissions from 1977 model year light duty trucks shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per vehicle mile.

(ii) *Carbon monoxide.* 20 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 3.1 grams per vehicle mile.

(2) The Standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in subpart B and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from 1977 model year gasoline-fueled light duty trucks shall not exceed:

(i) *Hydrocarbons.* 2 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in subpart B and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1977 model year gasoline-fueled light duty truck.

§ 86.077–10 Emission standards for 1977 gasoline-fueled heavy duty engines.

(a)(1) Exhaust emissions from new 1977 and later model year gasoline-fueled heavy duty engines shall not exceed:

(i) *Hydrocarbons plus oxides of nitrogen (as NO2).* 16 grams per brake horsepower hour.

(ii) *Carbon monoxide.* 40 grams per brake horsepower hour.

(2) The standards set forth in paragraph (a)(1) of this section refer to a composite sample representing the operating cycle set forth in subpart H and measured in accordance with those procedures.

(b) [Reserved].

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1977 and later model year gasoline-fueled heavy duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with test procedures prescribed in subpart H to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

§ 86.077–11 Emission standards for 1977 Diesel heavy duty engines.

(a)(1) The opacity of smoke emissions from new 1977 and later model year Diesel heavy duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (a)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in subpart I and measured and calculated in accordance with those procedures.

(b)(1) Exhaust gaseous emissions from new 1977 and later model year Diesel heavy duty engines shall not exceed:

(i) *Hydrocarbons plus oxides of nitrogen (as NO2).* 16 grams per brake horsepower hour.

(ii) *Carbon monoxide.* 40 grams per brake horsepower hour.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust gaseous emissions generated under the conditions set forth in subpart J and measured and calculated in accordance with those procedures.

(c)–(d) [Reserved]

(e) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with test procedures prescribed in subparts I and J to ascertain that such test engines meet the requirements of paragraphs (a) and (b) of this section.

§ 86.077–12—§ 86.077–20 [Reserved]

§ 86.077–21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4) A description of the proposed mileage (or service) accumulation procedure for durability testing.

(5) A statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(6) At the option of the manufacturer, the proposed composition of the emission data and durability data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under §§ 86.077–32, 86.077–33, and 86.077–34 shall be submitted in such multiple copies as the Administrator may require.

§ 86.077–22 Approval of application for certification; test fleet selections.

(a) After a review of the application for certification and any other information which the Administrator may require, the Administrator may approve the application and select a test fleet in accordance with § 86.077–24.

(b) The Administrator may disapprove in whole or in part an application for certification for reasons including incompleteness, inaccuracy, inappropriate proposed mileage (or service) accumulation procedures, test equipment, or fuel, and incorporation of defeat devices in vehicles (or on engines) described by the application.

(c) Where any part of an application is rejected, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection. Within 30 days following receipt of such notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after the review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.077–6 with respect to such issue.

§ 86.077–23 Required data.

The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information:

(a) Durability data on such vehicles (or engines) tested in accordance with the applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on or incorporated in the vehicle (or engine) for extended mileage (or extended operation), as well as a record of all pertinent maintenance (all maintenance and servicing for Diesel heavy duty engines) performed on the test vehicles (or test engines).

(b) Emission data.

(1) *Certification vehicles.* (i) Emission data on such vehicles tested in accordance with applicable test procedures and in such numbers as specified, which will show their emission after zero kilometers (zero miles) and 6436 kilometers (400 miles) of operation.

(ii) Emission data on those vehicles selected under § 86.077–24(b)(1)(v) and tested in accordance with the applicable test procedures of this part and in such numbers as therein specified, which shall be tested at zero kilometers (zero miles) at any altitude, and under high altitude conditions after 6436 kilometers (400 miles) of operation at any altitude.

(2) *Certification engines.* Emission data on such engines tested in accordance with applicable emission test procedures and in such numbers as specified, which will show their emissions after 0 hours and 125 hours of operation.

(c)(1) For light duty vehicles, light duty trucks and gasoline-fueled heavy duty engines, a description of tests performed to ascertain compliance with the general standards in § 86.077–5(b) and the data derived from such tests.

(2) For Diesel heavy duty engines, a statement that engines for which certification is requested conform to the requirements in § 86.077–5(b) and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.077–5(b) and the data derived from such tests are available to the Administrator upon request.

(d)(1) For light duty vehicles, light duty trucks and gasoline-fueled heavy duty engines, a statement that the test vehicles (or test engines) with respect to which data are submitted have been tested in accordance with the applicable test procedures, that they meet the requirements of such tests, and that, on the basis of such tests, they conform to the requirements of the regulations in this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent test data relating thereto shall be supplied.

(2) For Diesel heavy duty engines, a statement that the test engines with respect to which data are submitted to demonstrate compliance with § 86.077–11 are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification, and that on the basis of such tests the engines conform to the requirements of the regulations in this part. If such statements cannot be made with respect to any engine tested, the engine shall be identified, and all pertinent data relating hereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test engine was not as described in the application for certification or was not tested in accordance with applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the engine does not meet the applicable standards. The provisions of § 86.077–30(b) shall then be followed.

§ 86.077–24 Test vehicles and engines.

(a)(1) The vehicles or engines covered by an application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii) The dimension from the centerline of the crankshaft to the centerline of the camshaft.

(iii) The dimension from the centerline of the crankshaft to the top of the cylinder block head face.

(iv) The cylinder block configuration (air cooled or water cooled; L–6, 90° V–8, etc.).

(v) The location of intake and exhaust valves and the valve sizes (within a ⅛-inch range on the valve head diameter).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(viii) Catalytic converter characteristics; gasoline-fueled vehicles and engines only.

(ix) Thermal reactor characteristics; gasoline-fueled vehicles and engines only.

(3) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine.

(i) The bore and stroke.

(ii) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center position.

(iii) The intake manifold induction port size and configuration.

(iv) The exhaust manifold port size and configuration.

(v) The intake and exhaust valve sizes.

(vi) The fuel system.

(vii) The camshaft timing and ignition or injection timing characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a)(2) and (3) of this section, the Administrator will establish families for those engines based upon the features most related to their emission characteristics.

(b) Emission data.

(1) *Emission data vehicles.* Paragraph (b)(1) of this section applies to light duty vehicle and light duty truck emission data vehicles.

(i) Vehicles will be chosen to be operated and tested for emission data based upon the engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Vehicles of each engine family will be divided into engine displacement-exhaust emission control system-evaporative emission control system combinations as applicable. A projected sales volume will be established for each combination for the model year for which certification is sought. One vehicle of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a manufacturer's total production of vehicles of that engine family is represented, or until a maximum of four vehicles is selected. If any single combination represents over 70 percent, then two vehicles of that combination may be selected. The vehicle selected for each combination will be specified by the Administrator as to transmission type, fuel system, and inertia weight class.

(iii) The Administrator may select a maximum of four additional vehicles within each engine family based upon features indicating that they may have the highest emission levels of the vehicles in that engine family. In selecting these vehicles, the Administrator will consider such features as the emission control system combination, induction system characteristics, ignition system characteristics, fuel system, rated horsepower, rated torque, compression ratio, inertia weight class, transmission options, and axle ratios.

(iv) If the vehicles selected in accordance with paragraphs (b)(1)(ii) and (iii) of this section do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with the control system combination in the engine family and will be designated by the Administrator as to transmission type, fuel system, and inertia weight class.

(v) The Administrator will also select one vehicle for each engine-system combination within an engine family for which vehicles are to be sold to ultimate purchasers at high altitude.

(vi) The Administrator may combine testing requirements for any vehicle selected under paragraph (b)(1)(v) of this section with the testing requirements for any similar vehicle in the same engine-system combination selected under paragraphs (b)(1)(ii), (iii), or (iv) of this section by requiring a vehicle selected for testing under paragraphs (b)(1)(ii), (iii), or (iv) of this section to be modified (if necessary) after mileage accumulation and emission testing for the purpose of demonstrating compliance in accordance with § 86.077–23(b)(1)(ii).

(2) *Heavy duty gasoline-fueled emission data engines.* Paragraph (b)(2) of this section applies to heavy duty gasoline-fueled emission data engines.

(i) Engines will be chosen to be run for emission data based upon the engine family groupings. Within each engine

family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into engine displacement-exhaust emission control system combinations. A projected sales volume will be established for each combination for the applicable model year. One engine of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a manufacturer's total production of engines of that family is represented, or until a maximum of four engines is selected. The engines selected for each combination will be specified by the Administrator as to fuel system.

(iii) The Administrator may select a maximum of two additional engines within each engine family based upon features indicating that they may have the highest emission levels of the engines in that engine family. In selecting these engines, the Administrator will consider such features as the exhaust emission control system, induction system characteristics, ignition system characteristics, fuel system rated horsepower, rated torque, and compression ratio.

(iv) If the engines selected in accordance with paragraphs (b)(2) (ii) and (iii) of this section do not represent each engine displacement-exhaust emission control system combination, then one engine of each engine displacement-exhaust emission control system combination not represented shall be selected by the Administrator.

(3) *Heavy duty Diesel emission data engines.* Paragraph (b)(3) of this section applies to heavy duty Diesel emission data engines.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into groups based upon exhaust emission control system. One engine of each engine-system combination shall be run for smoke emission data and gaseous emission data as prescribed in § 86.077–26(c)(3). Either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine system combination, then one military engine shall be also selected. The engine with the highest fuel feed per stroke will usually be selected.

(iii) The Administrator may select a maximum of one additional engine within each engine system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system, fuel system, compression ratio, rated speed, rated horsepower, peak torque speed and peak torque.

(c) Durability data.

(1) *Durability data vehicles.* Paragraph (c)(1) of this section applies to light duty vehicle and light duty truck durability data vehicles.

(i) A durability vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system, and inertia weight class.

(ii) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system, and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of paragraph (c)(1)(i) of this section. Notice of an intent to operate and test additional vehicles shall be given to the Administrator not later than 30 days following notification of the test fleet selection.

(2) *Heavy duty gasoline-fueled durability data engines.* Paragraph (c)(2) of this section applies to heavy duty gasoline-fueled durability data engines.

(i) A durability data engine will be selected by the Administrator to represent each engine-system combination. The engine selected shall be of the displacement with the largest projected sales volume of engines with that exhaust emission control system in that engine family and will be designated by the Administrator as to fuel system.

(ii) [Reserved]

(iii) A manufacturer may elect to operate and test additional engines to represent any engine-system combination. The additional engines must be of the same engine displacement and fuel system as the engine selected for that combination in accordance with the provisions of paragraph (c)(2)(i) of this section. Notice of an intent to run additional engine shall be given to the Administrator not later than 30 days following notification of the test fleet selection. Deterioration factors calculated for each engine-system combination shall be applied separately to military and non-military engines within the same engine system combination.

(3) *Heavy duty Diesel durability data engines.* Paragraph (c)(3) of this section applies to heavy duty Diesel durability data engines.

(i) One engine from each engine-system combination shall be tested as prescribed in § 86.077–26(c)(3)(ii). At each test point, either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine which features the highest fuel feed per stroke, primarily at rated speed and secondarily at the speed of maximum rated torque, will usually be selected for durability testing. In the case where more than one engine in an engine-system combination has the highest fuel feed per stroke, the engine with the highest maximum rated horsepower will usually be selected for durability testing. If an engine system combination includes both military and nonmilitary engines, then the nonmilitary engine with the highest maximum rated horsepower will usually be selected for durability testing.

(ii) A manufacturer may elect to operate and test additional engines to represent any engine-system combination. The additional engines must be of the same model and fuel system as the engine selected in accordance with the provisions of paragraph (c)(3)(i) of this section. Notice of an intent to test additional engines shall be given to the Administrator not later than 30 days following notification of the test fleet selection. Deterioration factors calculated for each engine-system combination shall be applied separately to military and nonmilitary engines within the same engine system combination.

(d) For purposes of testing under § 86.077–26(g), the Administrator may require additional emission data vehicles (or emission data engines) and durability data vehicles (or durability data engines) identical in all material respects to vehicles (or engines) selected in accordance with paragraphs (b) and (c) of this section: Provided, That the number of vehicles selected shall not increase the size of either the emission data fleet or the durability data fleet by more than 20 percent or one vehicle, whichever is greater.

(e) Any manufacturer whose projected sales for the model year in which certification is sought is less than

(1) 2000 gasoline-fueled light duty vehicles, or

(2) 2000 Diesel powered light duty vehicles, or

(3) 2000 gasoline-fueled light duty trucks, or

(4) 2000 Diesel powered light duty trucks, or

(5) 700 gasoline-fueled heavy duty engines, or

(6) 200 Diesel heavy duty engines,

may request a reduction in the number of test vehicles (or engines) determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure.

(f) In lieu of testing an emission data or durability data vehicle (or engine) selected under paragraph (b) or (c) of this section, and submitting data therefore, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data and/or fuel evaporative emission data, as applicable on a similar vehicle (or engine) for which certification has previously been obtained.

(g)(1) This paragraph applies to light duty vehicles and light duty trucks.

(2) Where it is expected that more than 33 percent of an engine family will be equipped with an optional item, the full estimated weight of that item shall

be included, if required by the Administrator, in the curb weight computation for each vehicle available with that option in the engine family. Where it is expected that 33 percent or less of the vehicle in an engine family will be equipped with an item of optional equipment, no weight for that item will be added in computing curb weight. Optioncase of mutually exclusive options, only the weight of the heavier option will be added in computing curb weight. Optional equipment weighing less than 3 pounds per item need not be considered.

(3) Where it is expected that more than 33 percent of an engine family will be equipped with an item of optional equipment that can reasonably be expected to influence emissions, then such items of optional equipment shall actually be installed, unless specifically excluded by the Administrator, on all emission data and durability data vehicles in the engine family on which the option is intended to be offered in production. Optional equipment that can reasonably be expected to influence emissions are the air conditioner, power steering, power brakes and other items determined by the Administrator.

(4) Optional equipment that can reasonably be expected to influence emissions which is utilized on 33 percent or less of the vehicles in the engine family shall not be installed on any vehicle in that engine family unless specifically required under this section.

§ 86.077–25 Maintenance.

(a)(1) *Gasoline-fueled vehicles.* Paragraph (a) of this section applies to gasoline-fueled light duty vehicles and gasoline-fueled light duty trucks.

(2)(i) Scheduled maintenance on the engine, emission control system, and fuel system of durability vehicles shall be scheduled for performance during durability testing at the same mileage intervals that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle. Such maintenance shall be performed, except as provided in paragraph (a)(6)(iii) of this section, only under the following provisions.

(A) Scheduled major engine tuneups to manufacturer's specifications may be performed no more frequently than every 12,500 miles of scheduled driving, provided that no tuneup may be performed after 45,000 miles of scheduled driving. A scheduled major engine tuneup shall be restricted to paragraph (a)(2)(i)(A)(*1*) through (*11*) of this section and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Ignition system.

(*2*) Cold starting enrichment system (includes fast idle speed setting).

(*3*) Curb idle speed and air/fuel mixture.

(*4*) Drive belt tension on engine accessories.

(*5*) Valve lash.

(*6*) Inlet air and exhaust gas control valves.

(*7*) Engine bolt torque.

(*8*) Spark plugs.

(*9*) Fuel filter and air filter.

(*10*) Crankcase emission control system.

(*11*) Fuel evaporative emission control system.

(B) Change of engine and transmission oil, and change or service of oil filter will be allowed at the same mileage intervals that will be specified in the manufacturer's maintenance instructions.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to during scheduled major engine tuneups, once during the first 5,000 miles of vehicle operation.

(ii) Unscheduled maintenance on the engine, emission control system, and fuel system of durability vehicles may be performed, except as provided in paragraph (a)(2)(v)(A) of this section, only under the following provisions:

(A) Any persistently misfiring spark plug may be replaced, in addition to replacement at scheduled major engine tuneup points.

(B) Readjustment of the engine cold starting enrichment system may be performed if there is a problem of stalling or if there is visible black smoke.

(C) Readjustment of the engine idle-speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (a)(2)(i) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(D) The idle mixture may be reset, other than during scheduled major engine tuneups, only with the advance approval of the Administrator.

(iii) An exhaust gas recirculation (EGR) system may be serviced during durability testing only under one of the following provisions:

(A) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneups if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance at each of those mileage points. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(B) Manufacturers may service the EGR system as unscheduled maintenance a maximum of three times during the 50,000 miles if failure of the EGR system activates an audible and/or visual signal approved by the Administrator which alerts the vehicle operator to the need for EGR system maintenance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(C) Manufacturers may service the EGR system a maximum of three times during the 50,000 miles either at a scheduled major engine tuneup point or as unscheduled maintenance, if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance. The signal may be activated either by EGR system failure (unscheduled maintenance) or need for scheduled periodic maintenance. If maintenance is performed, the signal for scheduled periodic maintenance shall be reset. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(D) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneup(s) if failure to perform EGR system maintenance is not likely, as determined by the Administrator, to result in an improvement in vehicle performance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(iv) The catalytic converter may be serviced once during 50,000 miles if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for maintenance. The signal may be activated either by component failure or need for maintenance at a scheduled point.

(v) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability vehicles shall be performed only with the advance approval of the Administrator.

(A) In the case of unscheduled maintenance, such approval will be given if the Administrator:

(*1*) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle unrepresentative of vehicles in use, and does not require direct access to the combustion chamber, except for sparkplug, fuel injection component, or removable prechamber removal or replacement; and

(2) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfire, vehicle stall, overheating, fluid leakage, loss of oil pressure, or charge indicator warning.

(B) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (a)(2)(v)(A)(*1*).

(C) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the perform-

ance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on vehicles in use.

(vi) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle unrepresentative of vehicles in use, the vehicle shall not be used as a durability vehicle.

(vii) Where the Administrator agrees under § 86.077–26 to a mileage accumulation of less than 50,000 miles for durability testing, he may modify the requirements of this paragraph.

(3) (i) Adjustment of engine idle speed on emission data vehicles may be performed once before the 6436 kilometer (4000 mile) test point. Any other engine, emission control system or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission data vehicles shall be performed only with the advance approval of the Administrator.

(ii) Maintenance on emission data vehicles selected under § 86.077–24(b) (1) (v) and permitted to be tested for purposes of § 86.077–23(b) (1) (ii) under the provisions of § 86.077–24(b) (1) (vi) may be performed in conjunction with emission control system modifications at the 6436 kilometer (4000 mile) test point, and shall be performed in accordance with the maintenance instructions to be provided to the ultimate purchaser required under § 86.077–38.

(iii) Maintenance on those emission data vehicles selected under § 86.077–24 (b) (1) (v) which are not capable of being modified in the field for the purpose of complying with emission standards at an altitude other than intended by the original design may be performed in conjunction with the emission control system modifications at the 6436 kilometer (4000 mile) test point, and shall be approved in advance by the Administrator.

(4) Repairs to vehicle components of the durability or emission data vehicle, other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(5) Complete emission tests (see §§ 86.177–5 through 86.177–23) are required, unless waived by the Administrator, before and after any vehicle maintenance which may reasonably be expected to affect emissions. These test data shall be air posted to the Administrator within 24 hours (or delivered within 3 working days), after the tests, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken. A complete engineering report shall be delivered or air posted to the Administrator within 10 working days after the tests. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 86.077–23.

(6) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or vehicle malfunction (e.g., misfire, stall, black smoke), or an activation of an audible and/or visual signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(7) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and

(i) Are used in conjunction with scheduled maintenance on such components.

(ii) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (a) (2) (v) (A) of this section for durability vehicles or paragraph (a) (2) (i) of this section for emission data vehicles, or

(iii) Unless specifically authorized by the Administrator.

(b) (1) *Diesel vehicles.* Paragraph (b) of this section applies to Diesel powered light duty vehicles and Diesel powered light duty trucks.

(2) (i) Scheduled maintenance on the engine, emission control system, and fuel system of durability vehicles shall be scheduled for performance during durability testing at the same mileage intervals that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle. Such maintenance shall be performed only under the following provisions:

(A) Scheduled major engine tuneups to manufacturer's specifications may be performed no more frequently than every 12,500 miles of scheduled driving, provided that no tuneup may be performed after 45,000 miles of scheduled driving. A scheduled major engine tuneup shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel. A major engine tuneup shall be restricted to the following:

(*1*) Adjust low idle speed.

(*2*) Adjust valve lash if required.

(*3*) Adjust injector timing.

(*4*) Adjust governor.

(*5*) Clean and service injector tips.

(*6*) Adjust drive belt tension on engine accessories.

(*7*) Check engine bolt torque and tighten as required.

(B) Injectors may be changed if a persistent misfire is detected.

(C) Normal vehicle lubrication services (engine and transmission oil change and oil filter, fuel filter, and air filter servicing) will be allowed at manufacturer's recommended intervals.

(D) Readjustment of the engine idle settings may be performed only if there is a problem of stalling at stops.

(E) Engine idle speed may be adjusted at the 5,000 mile test point.

(F) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability vehicles shall be performed only with the advance approval of the Administrator.

(ii) Where the Administrator agrees under § 86.077–26 to a mileage accumulation of less than 50,000 miles for durability testing, he may modify the requirement of this paragraph.

(3) (i) Adjustment of engine idle speed on emission data vehicles may be performed once before the 6436 kilometer (4000 mile) test point. Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission data vehicles shall be performed only with the advance approval of the Administrator.

(ii) Maintenance on emission data vehicles selected under § 86.077–24(b) (1) (v) and permitted to be tested for purposes of § 86.077–23(b) (1) (ii) under the provisions of § 86.077–24(b) (1) (vi) may be performed in conjunction with emission control system modification at the 6436 kilometer (4000 mile) test point, and shall be performed in accordance with the maintenance instructions to be provided to the ultimate purchaser required under § 86.077–38.

(iii) Maintenance on those emission data vehicles selected under § 86.077–24(b) (1) (v) which are not capable of being modified in the field for the purpose of complying with emission standards at an altitude other than intended by the original design may be performed in conjunction with the emission control system modifications at the 6436 kilometer (4000 mile) test point, and shall be approved in advance by the Administrator.

(4) Repair to vehicle components of the durability or emission data vehicle, other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure or vehicle system malfunction or with the advance approval of the Administrator.

(5) Complete emission tests (see §§ 86.177–5 through 86.177–23) shall be run, unless waived by the Administrator, before and after any vehicle maintenance which may be reasonably be expected to affect emissions. These test data shall be supplied to the Administrator immediately after the tests, along with a complete record of all pertinent maintenance, including an engineering report of any malfunction diagnosis and the corrective action taken. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 86.077–23.

(6) If the Administrator determines that component failure or repairs performed have resulted in a substantial change to the engine-system combination, the vehicle shall not be used as a durability or emission data vehicle.

(7) The use of instruments, tools, or emission tests to identify malfunctioning, maladjusted, or defective engine components is not allowed unless specifically authorized by the Administrator.

(c)(1) *Gasoline-fueled heavy duty engines.* Paragraph (c) of this section applies to gasoline-fueled heavy duty engines.

(2)(i) Scheduled maintenance may be performed on durability engines only under the following provisions:

(A) Major engine tuneups to manufacturer's specifications may be performed no more frequently than every 375 hours of scheduled dynamometer operation, provided no tuneups are performed after 1375 hours of scheduled dynamometer operation. The maintenance to be performed on the durability engines shall be requested in the application for certification and shall be specified at the same intervals in the maintenance instructions which will be furnished to the ultimate purchaser of the vehicle in which the engine, which is represented by the test engine, is installed. (For equivalent dynamometer hours engine hours, and mileage intervals, see § 86.077–2.) A scheduled major engine tuneup shall be restricted to paragraphs (c)(2)(i)(A)(*1*) through (*12*) of this section and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by the customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Ignition system.

(*2*) Cold starting enrichment system (includes fast idle speed setting).

(*3*) Curb idle speed and air/fuel mixture.

(*4*) Drive belt tension on engine accessories.

(*5*) Valve lash.

(*6*) Inlet air and exhaust gas control valves.

(*7*) Engine bolt torque.

(*8*) Spark plugs.

(*9*) Fuel filter and air filter.

(*10*) Crankcase emission control system.

(*11*) Fuel evaporative emission control system.

(*12*) Exhaust gas recirculation system.

(B) Change of engine oil, and change or service of oil filter will be allowed at the equivalent intervals that will be specified in the manufacturer's maintenance instructions.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to during scheduled major engine tuneups, once during the first 125-hours of engine operation.

(ii) Unscheduled maintenance may be performed on durability engines, except as provided in paragraph (c)(v)(A) of this section, only under the following provisions:

(A) Any persistently misfiring spark plug may be replaced, in addition to replacement at scheduled major engine tuneup points.

(B) Readjustment of the engine cold starting enrichment system may be performed if there is a problem of stalling or if there is visible black smoke.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (c)(2)(i) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, if there is a problem of stalling.

(D) The idle mixture may be reset, other than during scheduled major engine tuneups, only with the advance approval of the Administrator.

(iii)—(iv) [Reserved]

(v) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning or replacement on durability engines shall be performed only with the advance approval of the Administrator.

(A) In the case of unscheduled maintenance such approval will be given if the Administrator:

(*1*) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the engine unrepresentative of engines in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and

(*2*) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfire, engine stall, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss.

(B) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (c)(2)(v)(A)(*1*).

(C) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintenanced by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on engines in use.

(vi) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the engine unrepresentative of engines in use, the engine shall not be used as a durability engine.

(3)(i) Scheduled maintenance on emission data engines is limited to the adjustment of idle speed once before the 125-hour test point, provided the idle speed is outside the manufacturer's specifications to be shown on the engine label (see § 86.077–35(a)(2)(iii)).

(ii) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement shall be performed only with the advance approval of the Administrator.

(4) [Reserved]

(5)(i) Complete emission tests (see §§ 86.777–5 through 86.777–15) are required unless waived by the Administrator, before and after:

(A) Scheduled maintenance approved for durability engines.

(B) Unscheduled maintenance which may reasonably be expected to affect emissions.

(ii) The tests before and after scheduled maintenance, which are performed on durability engines prior to 117 hours, are waived. The test before scheduled maintenance, which is performed on durability engines after 117 hours and prior to 133 hours, is waived. The after-maintenance test must be run and the results used in the deterioration factor calculation in accordance with § 86.077–28(b)(4)(i)(A)(2).

(iii) The idle speed reset and any scheduled maintenance on the emission data engine shall be performed prior to the 125-hour test. The before maintenance and after-maintenance tests associated with idle speed reset and scheduled maintenance on the emission data engine are waived.

(iv) Test data required by this paragraph shall be air posted to the Administrator within 72 hours (or delivered within five working days), along with a complete record of all pertinent maintenance.

(v) When unscheduled maintenance is approved, a preliminary engineering report, unless waived by the Administrator, shall be supplied within three working days. A final engineering report shall be delivered within ten working days after the completion of the emission tests. The Administrator may approve an extension of the time requirements for the final engineering report.

(vi) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.077–23.

(6) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or engine malfunction (e.g., misfire, stall).

(7) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets, and

(i) Are used in conjunction with scheduled maintenance on such components;

(ii) Are used subsequent to the identification of an engine failure or malfunction, as provided in paragraph (c)(2)(v)(A) of this section for durability engines or paragraph (c)(3) of this section for emission data engines; or

(iii) Unless specifically authorized by the Administrator.

(d)(1) *Diesel heavy duty engines.* Paragraph (d) of this section applies to Diesel heavy duty engines.

(2)(i) Scheduled maintenance may be performed on durability engines only under the following provisions:

(A) One major engine servicing manufacturer's specifications may be performed prior to 875 hours (±8 hours) of scheduled dynamometer operation provided such maintenance is requested in the application for certification and is

specified in the maintenance instructions which will be furnished to the ultimate purchaser of the motor vehicle in which the engine, which is represented by the test engine, is installed. (For equivalent dynamometer hours, engine hours, and mileage intervals, see § 86.077–2.) A scheduled major servicing shall be restricted to paragraphs (d) (1) through (7) of this section and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(1) Low idle speed.
(2) Drive belt tension.
(3) Engine bolt torque.
(4) Valve lash.
(5) Injection timing.
(6) Injector assemblies.
(7) Governor settings.

(B) Normal engine servicing such as engine oil change, and oil filter, fuel filter, and air filter cleaning or replacement will be allowed at manufacturer's recommended intervals. If approved in advance by the Administrator, the maintenance for these items may differ from that specified in the manufacturer's maintenance instructions.

(C) Readjustment of the engine low idle speed may be performed once during the first 125-hours of engine operation.

(ii) Unscheduled maintenance may be performed on durability engines, except as provided in paragraph (d) (2) (v) (A) of this section, only under the following provisions:

(A) Injectors may be changed if a persistent misfire is detected.

(B) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (d) (2) (i) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(iii)–(iv) [Reserved]

(v) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability engines shall be performed only with the advance approval of the Administrator.

(A) In the case of unscheduled maintenance such approval will be given if the Administrator:

(1) Has made a preliminary determination that part failure of system malfunction, or the repair of such failure or malfunction, does not render the engine unrepresentative of engines in use, and does not require direct access to the combustion chamber, except for fuel injection component, or removable prechamber removal or replacement; and

(2) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfire, engine stall, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss.

(B) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (d) (2) (v) (A) (1).

(C) Requests for authorization of scheduled maintenance of emission control related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on engines in use.

(vi) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the engine unrepresentative of engines in use, the engine shall not be used as a durability engine.

(3) (i) Scheduled maintenance on emission data engines is limited to the adjustment of idle speed once before the 125-hour test point, provided the idle speed is outside the manufacturer's specifications required to be shown on the engine label (see § 86.077–35(a) (3) (iii)).

(ii) Any other engine, emission control system, or fuel system, adjustment, repair, removal, disassembly, cleaning, servicing, or replacement shall be performed only with the advance approval of the Administrator.

(4) [Reserved]

(5) (i) Complete emission tests (see §§ 86.877–5 through 86.877–14 and §§ 86.977–5 through 86.877–15) are required, unless waived by the Administrator, before and after:

(A) Scheduled maintenance approved for durability engines.

(B) Unscheduled maintenance which may reasonably be expected to affect emissions.

(ii) The tests before and after scheduled maintenance, which are performed on durability engines prior to 117 hours, are waived. The test before scheduled maintenance, which is performed on durability engines after 117 hours and prior to 133 hours, is waived. The after-maintenance test must be run and the results used in the deterioration factor calculation in accordance with § 86.077–28(c) (4) (i) (B) or (C).

(iii) The idle speed reset and any scheduled maintenance on the emission-data engine shall be performed prior to the 125-hour test. The before-maintenance and after-maintenance tests associated with idle speed reset and scheduled maintenance on the emission-data engine are waived.

(iv) Test data required by this paragraph shall be air posted to the Administrator within 72 hours of test completion (or delivered within 5 working days), along with a complete record of all pertinent maintenance.

(v) When unscheduled maintenance is approved, a preliminary engineering report, unless waived by the Administrator, shall be air posted within 24 hours (or delivered within 5 working days). A final engineering report shall be delivered or air posted within ten working days after the completion of the emission tests. The Administrator may approve an extension of the time requirements for the final engineering report.

(vi) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.077–23.

(6) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or engine malfunction (e.g., misfire, stall).

(7) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and

(i) Are used in conjunction with scheduled maintenance on such components;

(ii) Are used subsequent to the identification of an engine failure or malfunction, as provided in paragraph (d) (2) (v) (A) of this section for durability engines or paragraph (d) (3) of this section for emission data engines; or

(iii) Unless specifically authorized by the Administrator.

§ 86.077–26 Mileage and service accumulation; emission measurements.

(a) (1) Paragraph (a) of this section applies to light duty vehicles and light duty trucks.

(2) The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV of this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.177–11(d), the manufacturer may elect to conduct the respective emission tests at the inertia weight corresponding to the higher loaded vehicle weight.

(3) Emission data vehicles.

(i) *Gasoline-fueled.* (A) Each gasoline-fueled emission data vehicle shall be driven 6436 kilometers (4000 miles) with all emission control systems installed and operating. Complete exhaust emission and fuel evaporative emission tests (see § 86.177–5(a)) shall be conducted at zero kilometers (zero miles) and 6436 kilometers (4000 miles) unless the Administrator determines, based on data submitted under § 86.077–24(f) that only the exhaust emission test (see § 86.177–5(b)) shall be conducted at zero kilometers (zero miles) and 6436 kilometers (4000 miles).

(B) The emission data vehicle(s) selected for testing under § 86.077–24(b) (1) (v) shall be driven 6436 kilometers (4000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and 6436 kilometers (4000 miles) under high altitude conditions.

(C) The emission data vehicle(s) selected for testing under § 86.077–24(b) (1) (v) and permitted to be tested for purposes of § 86.077–23(b) (1) (ii) under the provisions of § 86.077–24(b) (1) (vi)

shall be driven 6436 kilometers (4000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6436 kilometers (4000 miles) under both low and high altitude conditions. For the purposes of this subparagraph, low altitude means any elevation less than 549 meters (1800 feet).

(ii) *Diesel.* (A) Each Diesel emission data vehicle shall be driven 6436 kilometers (4000 miles) with all emission control systems installed and operating. Emission tests shall be conducted at zero kilometers (zero miles) and 6436 kilometers (4000 miles).

(B) The emission data vehicle(s) selected for testing under § 86.077–24(b)(1)(v) shall be driven 6436 kilometers (4000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and 6436 kilometers (4000 miles) under high altitude conditions.

(C) The emission data vehicle(s) selected for testing under § 86.077–24(b)(1)(v) and permitted to be tested for purposes of § 86.077–23(b)(1)(ii) under the provisions of § 86.077–24(b)(1)(vi) shall be driven 6436 kilometers (4000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6436 kilometers (4000 miles) under both low and high altitude conditions. For the purpose of this subparagraph low altitude means any elevation less than 549 meters (1800 feet).

(4) Durability data vehicles.

(i) *Gasoline-fueled.* Each gasoline-fueled durability data vehicle shall be driven, with all emission control systems installed and operating for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objective of this procedure. Complete exhaust emission and fuel evaporative emission tests (see § 86.177–5(a)) shall be made at the following mileage points: 0, 5,000, 10,000, 15,000, 20,000, 25,000, 30,000, 35,000, 40,000, 45,000 and 50,000, unless the Administrator determines based on data submitted under § 86.077–24(f) that only the exhaust emission tests (see § 86.177–5(b)) shall be made at the mileage points specified in this paragraph.

(ii) *Diesel fueled.* Each Diesel durability vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objectives of this procedure. Complete emission tests (see §§ 86.177–6 through 86.177–23) shall be made at the following mileage points: 0, 5,000, 10,000, 15,000, 20,000, 25,000, 30,000, 35,000, 40,000, 45,000, and 50,000.

(5) All tests required by this subpart to be conducted after every 5,000 miles of driving of durability data vehicles and 4,000 miles for emission data vehicles must be conducted at any accumulated mileage within 250 miles of each of those test points.

(6)(i) The results of each emission test shall be supplied to the Administrator immediately after the test. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 24 hours (or delivered within three working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.077–23. Where the Administrator conducts a test on durability vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be rounded, using the "Rounding Off Method" specified in ASTM E 29–67, to the number of places to the right of the decimal point indicated by expressing the applicable standard in § 86.077–8 or § 86.077–9 to three significant figures.

(7) Whenever the manufacturer proposes to operate and test a vehicle which may be used for emission or durability data, he shall provide the zero mile test data to the Administrator and make the vehicle available for such testing under § 86.077–29 as the Administrator may require before beginning to accumulate mileage on the vehicle. Failure to comply with this requirement will invalidate all test data submitted for this vehicle.

(8) Once a manufacturer begins to operate an emission data or durability data vehicle, as indicated by compliance with paragraph (a)(7) of this section, he shall continue to run the vehicle to 4,000 miles or 50,000 miles, respectively, and the data from the vehicle will be used in the calculations under § 86.077–28. Discontinuation of a vehicle shall be allowed only with the written consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(ii) The test procedures in §§ 86.177–5 through 86.177–23 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification vehicle other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(b)(1) Paragraph (b) of this section applies to gasoline-fueled heavy duty engines.

(2) The engine dynamometer service accumulation schedule will consist of several operating conditions which give the same percentage of time at various manifolds vacuums and modes as specified in the emission test cycle. The average speed shall be between 1,650 and 1,700 r.p.m. Subject to the requirements as to average speed, there must be operation at speeds in excess of 3,200 r.p.m. (but not in excess of governed speed for governed engines or rated speed for non-governed engines) for a cumulative maximum of 0.5 percent of the actual cycle time, excluding time in transient conditions. Maximum cycle time shall be 15 minutes. A cycle approved in advance by the Administrator shall be used.

(3) Emission data engines: Each emission data engine shall be operated for 125 hours with all emission control systems installed and operating. Emission tests shall be conducted at zero and 125 hours. Evaporative emission controls need not be connected provided normal operating conditions are maintained the engine induction system.

(4) Durability data engines: Each durability data engine shall be operated, with all emission control systems installed and operating, for 1,500 hours. Emission measurement, as prescribed, shall be made at zero hours and at each 125-hour interval. Evaporative emission control need not be connected provided normal operating conditions are maintained in the induction systems.

(5) All tests required by this subpart to be conducted after 125 hours of operation or at any multiple of 125 hours may be conducted at any accumulated number of hours within 8 hours of 125 hours or the appropriate multiple of 125 hours, respectively.

(6)(i) The results of each emission test shall be supplied to the Administrator within 72 hours (or delivered within five working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within five working days). In addition, all test data shall be

compiled and provided to the Administrator in accordance with § 86.077–23. Where the Administrator conducts a test on a durability engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E 29–67.

(7) Whenever the manufacturer proposes to operate and test an engine which may be used for emission or durability data, he shall provide the zero-hour test data to the Administrator and make the engine available for such testing under § 86.077–29 as the Administrator may require, before beginning to accumulate hours on the engine. Failure to comply with this requirement will invalidate all test data later submitted for this engine.

(8) Once a manufacturer begins to operate an emission data durability data engine, as indicated by compliance with paragraph (b)(7) of this section, he shall continue to run the engine to 125 hours or 1,500 hours, respectively, and the data from the engine will be used in the calculations under § 86.777–15. Discontinuation of an engine shall be allowed only with the prior written consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(ii) The test procedures (§§ 86.777–5 through 86.777–15) will be followed by the Administrator. The Administrator will test the engines at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

(c)(1) Paragraph (c) of this section applies to Diesel heavy duty engines.

(2) The procedures set forth in this section describe the service accumulation that shall be accomplished on each test engine and when tests are to be conducted.

(3)(i) Emission data engines: Each engine shall be operated with all emission control systems installed and operating on a dynamometer for 125 hours. haust emission tests shall be conducted at zero and 125 hours of operation.

(ii) Durability data engines: Each engine shall be operated on a dynamometer for 1,000 hours. Exhaust emission measurements, as prescribed, shall be made at zero-hours and at each 125-hour interval.

(4) A break-in procedure, not to exceed 20 hours, may be run if approved in writing in advance by the Administrator. This procedure would run after the zero-hour test, and the hours accumulated would not be counted as part of the service accumulation.

(5) Before service accumulation can begin, the following criteria must be met. Failure to comply with these requirements shall invalidate all test data submitted for an engine.

(i) Each engine shall produce at least 95 percent of the maximum horsepower, corrected to rating conditions, at 95 to 100 percent of the rated speed.

(ii) The fuel rate at maximum horsepower shall be within manufacturer's specifications.

(iii) The zero-hour test data shall be provided to the Administrator and the engine shall be made available for such testing under § 86.077–29 as the Administrator may require.

(6) During service accumulation, hours can be credited toward the required service accumulation hours when the following criteria are met. If these criteria cannot be met, engine operation shall be discontinued and the Administrator shall be notified immediately. (Adjustments to the fuel rate can be approved under the provisions of § 86.077–25).

(i) Each engine shall produce at least 95 percent of the maximum horsepower, at 95 to 100 percent of the rated speed, observed during zero-hour testing. Horsepower values shall be corrected to the rating conditions.

(ii) The engine shall be operated at 75 percent of the inlet and exhaust restrictions specified in § 86.877–8 except that the tolerance will be ±3 inches of water and ±0.5 inches of Hg respectively.

(7) During each emission test the inlet and exhaust restrictions shall be specified in § 86.877–8.

(8) Tests, other than zero hour tests, may be conducted within eight (8) hours of the nominal test point.

(9)(i) The results of each emission test shall be air posted to the Administrator within 72 hours of test completion (or delivered within five working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests (not to exceed three valid tests) at any test point, the number of tests must be the same at each point. The data obtained from all valid tests shall be used in the calculation of the deterioration factor. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within five working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.077–23. Where the Administrator conducts a test on a durability engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E 29–67.

(10) Once a manufacturer begins to operate an emission data or durability data engine, as indicated by compliance with paragraph (c) of this section, he shall continue to run the engine to 125 hours or 1,000 hours respectively, and the data from the engine shall be used in the calculations under §§ 86.877–14 and 86.977–15. Discontinuation of an engine shall be allowed only with the prior written consent of the Administrator.

(11)(i) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases, the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(ii) The test procedures (§§ 86.877–5 through 86.877–14 and §§ 86.977–5 through 86.977–15) will be followed by the Administrator. The Administrator will test the engines at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(12) Emission testing of any type with respect to any certification engine other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

§ 86.077–27 Special test procedures.

(a) For light duty vehicles, light duty trucks and gasoline-fueled heavy duty engines, the Administrator may, on the basis of a written application therefore by a manufacturer, prescribe test procedures, other than those set forth in this part, for any motor vehicle (or motor vehicle engine) which he determines is

not susceptible to satisfactory testing by the procedures set forth herein or in subparts B, H, I, and J.

(b) For Diesel heavy duty engines, the Administrator may prescribe test procedures, other than those set forth in this part, for any motor vehicle engine which he determines is not susceptible to satisfactory testing by the procedures set forth herein or in subparts I and J.

§ 86.077–28 Compliance with emission standards.

(a)(1) Paragraph (a) of this section applies to light duty vehicles and light duty trucks.

(2) The applicable exhaust and fuel evaporative emission standards in § 86.077–8 and § 86.077–9 apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance of a new motor vehicle with exhaust and fuel evaporative emission standards, as applicable, is as follows:

(i) Separate emission deterioration factors shall be determined from the emission results of the durability data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, exhaust NOx, and fuel evaporative HC, as applicable.

(A) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*1*) All valid emission data from the tests required under § 86.077–26(a)(4), except the zero mile tests. This shall include the official test results, as determined in § 86.077–29 for all tests conducted on all durability data vehicles of the combination selected under § 86.077–24(c) (including all vehicles elected be operated by the manufacturer under § 86.077–24(c)(1)(ii)).

(2) All emission data from the tests conducted before and after the scheduled maintenance provided in § 86.077–25(a).

(3) All emission data from tests required by maintenance approved under § 86.077–25, in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(B) All applicable results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The interpolated 4,000- and 50,000-mile points on this line must be within the standards provided in §§ 86.077–8 or 86.077–9, as applicable, or the data will not be acceptable for use in calculation of a deterioration factor, unless no applicable data point exceeded the standard.

(C) An exhaust emission deterioration factor shall be calculated for each combination as follows:

Factor-exhaust emissions interpolated to 50,000 miles/exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29–67.

(D) For gasoline-fueled vehicles, an evaporative emission deterioration factor shall be calculated for each combination by subtracting the evaporative emissions interpolated to 4,000 miles from the evaporative emissions interpolated to 50,000 miles. These interpolated values shall be carried out, in accordance with ASTM E 29–67, to a minimum of three decimal places to the right of the decimal point before subtracting one from the other to determine the deterioration factor.

(ii)(A) The exhaust emission test results for each emission data vehicle shall be multiplied by the appropriate deterioration factor, provided, that if a deterioration factor as computed in paragraph (a)(4)(i)(C) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The evaporative emission test results for each combination shall be adjusted by addition of the appropriate deterioration factor, provided, that if a deterioration factor as computed in paragraph (a)(4)(i)(D) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(iii) The emissions to compare with the standard shall be the adjusted emissions of paragraphs (a)(4)(ii)(A) and (B) of this section for each emission data vehicle. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29–67, to two significant figures. The rounded emission values may not exceed the standard.

(iv) Every test vehicle of an engine family must comply with all applicable standards, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(b)(1) Paragraph (b) of this section applies to gasoline-fueled heavy duty engines.

(2) The exhaust emission standards in § 86.077–10 apply to the emissions of engines for their useful life.

(3) Since emission control efficiency decreases with the accumulation of hours on the engine, the emission level of an engine which has accumulated 1,500 hours of dynamometer operation will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance of a new engine with exhaust emission standards is as follows:

(i) Separate emission deterioration factors shall be determined from the emission results of the durability data engines for each engine-system combination. Separate factors shall be established for CO and for the combined emissions of HC and NOx.

(A) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*1*) All emission data from the test required under § 86.077–26(b)(4), except the zero-hour tests. This shall include the official test results, as determined in § 86.077–29, for all tests conducted on all durability engines of the combination selected under § 86.077–24(c)(2) (including all engines elected to be operated by the manufacturer under § 86.077–24(c)(2)(iii)).

(*2*) All emission data from the test conducted before and after maintenance provided in § 86.077–25(c)(2)(i)(A).

(3) All emission data from the test conducted before and after maintenance provided in § 86.077–25(c)(2)(v)(C) if emission tests were conducted.

(B) All applicable emission results for (*1*) HC+NOx and (*2*) CO shall be plotted as a function of durability hours which shall be consistently rounded to the nearest hour. Emission data shall have two figures to the right of the decimal. The best fit straight lines ((*1*) HC+NOx and (*2*) CO), fitted by the method of least squares, shall be drawn through these data points. The interpolated 125-hour and 1500-hour points on each line, rounded to whole numbers in accordance with ASTM E 29–67, must be within the standards specified in § 86.077–10 or the data shall not be used in the calculation of a deterioration factor, unless no applicable data points exceed the standards.

(C) The interpolated values shall be used to calculate a deterioration factor as follows:

Factor=Exhaust emissions interpolated to 1500-hours minus the exhaust emissions interpolated to 125 hours. (Negative deterioration factors shall be considered zero.)

(ii) The appropriate deterioration factor, carried out to two places to the right of the decimal point, shall be added to the exhaust emission test results, carried out to two places to the right of the decimal point, for each emission data engine.

(iii) The emission values to compare with the standards shall be the adjusted emission values of paragraph (b)(4)(ii) of this section rounded to whole numbers in accordance with ASTM E 29–67 for each emission data engine.

(iv) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (b)(4)(iii) of this section, before any engine in that family will be certified.

(c)(1) Paragraph (c) of this section applies to Diesel heavy duty engines.

(2) The emission standards in § 86.077–11 apply to the emissions of engines for their useful lives.

(3) Since emission control efficiency decreases with accumulation of hours on the engine, the emission level of an engine which has accumulated 1,000 hours of dynamometer operation will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance with emission standards in heavy duty Diesel engines is as follows:

(i) Emission deterioration factors for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), the peak opacity (designated as "C"), the CO exhaust emissions, and the HC+NOx exhaust emissions shall be established separately for each engine-system combination.

(A) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*1*) All emission data from the tests required under § 86.077–26(c)(3)(ii), except the zero-hour tests. This shall include the official test results, as determined in § 86.077–29, for all tests conducted on all durability engines of the combination selected under § 86.077–24(c)(3)(i) (including all engines selected to be operated by the manufacturer under § 86.077–24(c)(3)(ii)).

(*2*) All emission data from the tests conducted before and after the maintenance provided in § 86.077–25(d)(2)(i)(A) if emission tests were conducted.

(*3*) All emission data from the tests conducted before and after maintenance provided in § 86.077–25(d)(2)(v)(C) if emission tests were conducted.

(B) All applicable emission results for (1) HC+NOx, (2) CO, (3) acceleration smoke ("a"), (4) lugging smoke ("b"), and (5) peak smoke ("c") shall be plotted as a function of durability hours which shall be consistently rounded to the nearest hour. Emission data shall have two figures to the right of the decimal. The best fit straight lines, fitted by the method of least squares, shall be drawn through these data points. The interpolated 125- and 1000-hour points on each line, rounded to whole numbers in accordance with ASTM E 29–67, must be within the standards specified in § 86.077–11 or the data shall not be used in the calculation of the deterioration factor, unless no applicable data points exceeded the standards.

(C) The interpolated values shall be used to calculate a deterioration factor as follows:

Factor-Exhaust emissions (both smoke and gaseous) interpolated to 1000 hours minus the exhaust emissions interpolated to 125 hours. (Negative deterioration factors shall be considered zero).

(ii) The appropriate deterioration factor, carried out to the two places to the right of the decimal point, shall be added to the exhaust emission test results, carried out to the two places to the right of the decimal point, for each emission data engine.

(iii) The emission values to compare with the standards shall be the adjusted emission values of paragraph (c)(4)(ii) of this section rounded to whole numbers in accordance with ASTM E 29–67 for each emission data engine.

(iv) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (c)(4)(iii) of this section, before any engine in that family will be certified.

§ 86.077–29 Testing by the Administrator.

(a)(1) Paragraph (a) of this section applies to light duty vehicles and light duty trucks.

(2) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purposes of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test shall, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that test point, provided, that if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, and further provided, that if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provisions of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission or further information.

(iii)(A) The emission data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown the vehicle label (see § 86.077–35(a)(1)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle shall be adjusted, at the facility designated by the Administrator, prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle shall be used as an emission data vehicle.

(B) If the Administrator determines that the test data developed under paragraph (a)(3)(iii)(A) of this section would cause an emission data vehicle to fail due to excessive 4,000 mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, the vehicle may be readjusted to manufacturer's specifications, if these adjustments were made incorrectly prior to the first test, and other maintenance or repairs may be performed in accordance with § 85.077–25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission data vehicle.

(iv) If sufficient durability data are not available, at the time of any emission test conducted under paragraph (a)(2) of this section, to enable the Administrator to determine whether an emission data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (a)(3)(iii)(A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point, provided, that if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, and further provided, that if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii)(A) The emission data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the

engine label (see § 86.077–35(a)(2)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report the Administrator will determine if the engine shall be used as an emission data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed.

(*1*) The manufacturer may request a retest. Before the retest, the engine may be readjusted to manufacturer's specifications, if these adjustments were made incorrectly prior to the first test, and other maintenance or repairs may be performed in accordance with § 86.077–25. All work on the engine shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (b)(3)(iii)(B)(*1*) and (*2*) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

§ 86.077–30 Certification.

(a)(1) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.077–7(c) and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meets the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) (or engine(s)) except in cases covered by paragraph (c) of this section. If applicable, the certificate will state which vehicles are certified for sale at high altitude.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part. Each such certificate shall contain the following language:

This certificate covers only those new motor vehicles (or new motor vehicle engines) which conform, in all material respects, to the design specifications that applied to those vehicles (or engines) described in the application for certification and which are produced during the ____ model year production period of the said manufacturer, as defined in 40 CFR 86.077–2.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 86.077–7(c) which concern either the vehicle (or engine) certified, or any production vehicle (or production engine) covered by this certificate, or any production vehicle (or production engine) which when completed will be claimed to be covered by this certificate. Failure to comply with all the requirements of § 86.077–7(c) with respect to any such vehicle (or engine) may lead to revocation or suspension of this certificate as specified in 40 CFR § 86.077–30(c). It is also a term of this certificate that this certificate may be revoked or suspended for the other reasons stated in § 86.077–30(c).

(3) One such certificate will be issued for each engine family and will certify compliance with no more than one set of applicable standards.

(4) A violation of section 203(a)(1) of the Clean Air Act occurs when any manufacturer sells, offers for sale, or delivers for introduction into commerce at high altitude locations any light duty vehicle or light duty truck subject to the regulations under the Act which is not covered by a certificate of conformity issued under this part, unless such manufacturer has substantial reason to believe that such motor vehicle will not be sold to an ultimate purchaser for use at a high altitude location.

(5) For the purpose of paragraph (a)(4), "high altitude location" means the intended location of registration, licensing, or titling of such motor vehicle by the ultimate purchaser, such location identified by name and altitude.

(6) For the purpose of paragraph (a)(4) of this section determination of "high altitude location" shall rest with the U.S. Geological Survey, as published in that Agency's 1:250,000 scale series of topographic maps, for the United States.

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards by observing the following relationships:

(i) Light duty vehicles and light duty trucks.

(A) A test vehicle selected under § 86.077–24(b)(1)(ii) or (iv) shall represent all vehicles in the same engine family of the same engine displacement-exhaust emission control system-evaporative emission control system combination, as applicable, to be sold below 1219 meters (4,000 feet) in elevation.

(B) A test vehicle selected under § 86.077–24(b)(1)(iii) shall represent all vehicles in the same engine family of the same engine displacement-exhaust emission control system-transmission type-fuel system combination to be sold below 1219 meters (4,000 feet) in elevation.

(C) A test vehicle selected under § 86.077–24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(D) A test vehicle selected under § 86.077–24(b)(1)(v) shall represent all vehicles of the same engine-system combination to be sold at high altitude.

(ii) Gasoline-fueled heavy duty engines.

(A) A test engine selected under § 86.077–24(b)(2)(ii) and (iv) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(B) A test engine selected under § 86.077–24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A test engine selected under § 86.077–24(c)(2)(i) shall represent all engines of the same engine-system combination.

(iii) Diesel heavy duty engines.

(A) A test engine selected under § 86.077–24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(B) A test engine selected under § 86.077–24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(C) A test engine selected under § 86.077–24(c)(3)(i) shall represent all engines of the same engine-system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family all of which comply with applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.077–29, data or information derived from any inspection carried out under § 86.077–7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.077–6 with respect to such issue.

(4) The manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test vehicle(s) (or test engine(s)) determined not in compliance with applicable standards.

(i) Request a hearing under § 86.077–6; or

(ii) Delete from the application for certification the vehicles (or engines) represented by the failing test vehicle (or failing test engine). (Vehicles or engines so deleted may be included in a later request for certification under § 86.077–32.) The Administrator will then select in place of each failing vehicle (or failing engine) an alternate vehicle (or alternate engine) chosen in accordance with selection criteria employed in selecting the vehicle (or engine) that failed; or

(iii) Modify the test vehicle (or test engine) and demonstrate by testing that it meets applicable standards. Another vehicle (or engine) which is in all material respects the same as the first vehicle (or engine) as modified, shall then be operated and tested in accordance with applicable test procedures.

(5) If the manufacturer does not request a hearing or present the required data under paragraph (b)(4) of this section, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate or invalid any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act or of this part with respect to such vehicle (or engine);

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.077–7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or build up into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in (C) of this subdivision;

(E) Any records, documents, reports or histories required by this part to be kept concerning any of the above.

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.077–7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraphs (c)(1)(i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1)(iii), or (c)(1)(iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.077–7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (c)(1)(iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.077–6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid ab initio.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.077–6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue he will grant the request with respect to such issue.

§ 86.077–31 Separate certification.

Where possible a manufacturer should include in a single application for certification all vehicles (or engines) for which certification is required. A manufacturer may, however, choose to apply separately for certification of part of his product line. The selection of test vehicles (or test engines) and the computation of test results will be determined separately for each application.

§ 86.077–32 Addition of a vehicle or engine after certification.

(a) If a manufacturer proposes to add to his product line a vehicle (or engine) of the same engine-system combination as vehicles (or engines) previously certified but which was not described in the application for certification when the test vehicle(s) (or test engine(s)) representing other vehicles (or engines) of that combination was certified, he shall notify the Administrator. Such notification shall be in advance of the addition unless the manufacturer elects to follow the procedure described in § 86.077–34. This notification shall include a full description of the vehicle (or engine) to be added.

(b) The Administrator may require the manufacturer to perform such tests on the test vehicle(s) (or test engine(s)) representing the vehicle (or engine) to be added which would have been required if the vehicle (or engine) had been included in the original application for certification.

(c) If, after a review of the test reports and data submitted by the manufacturer, and data derived from any testing conducted under § 86.077–29, the Administrator determines that the test vehicle(s) or test engine(s) meets all applicable standards, the appropriate certificate will be amended accordingly. If the Administrator determines that the test vehicle(s) (or test engine(s)) does not meet applicable standards, he will proceed under § 86.077–30(b).

§ 86.077–33 Changes to a vehicle or engine covered by certification.

(a) The manufacturer shall notify the Administrator of any change in production vehicles (or production engines) in respect to any of the parameters listed in § 86.077–24(a)(3), § 86.077–24(b)(1)(iii), § 86.077–24(b)(2)(iii) or § 86.077–24(b)(3)(iii) as applicable, giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 86.077–34.

(b) Based upon the description of the change, and data derived from such testing as the Administrator may require or conduct, the Administrator will determine whether the vehicle (or engine), as modified, would still be covered by the certificate of conformity then in effect.

(c) If the Administrator determines that the outstanding certificate would cover the modified vehicles (or engines) he will notify the manufacturer in writing. Except as provided in § 86.077–34 the change may not be put into effect prior to the manufacturer's receiving this notification. If the Administrator determines that the modified vehicles (or engines) would not be covered by the certificate then in effect, then the modified vehicles (or engines) shall be treated as additions to the product line subject to § 86.077–32.

§ 86.077–34 Alternative procedure for notification of additions and changes.

(a) A manufacturer may, in lieu of notifying the Administrator in advance of an addition of a vehicle (or engine) under § 86.077–32 or a change in a vehicle (or engine) under § 86.077–33 notify him concurrently with the making of the change if the manufacturer believes the addition or change will not require any testing under the appropriate section. Upon notification to the Administrator, the manufacturer may proceed to put the addition or change into effect.

(b) The manufacturer may continue to produce vehicles (or engines) as described in the notification to the Administrator for a maximum of 30 days, unless the Administrator grants an exten-

sion in writing. This period may be shortened by a notification in accordance with paragraph (c) of this section.

(c) If the Administrator determines, based upon a description of the addition or change, that no test data will be required, he will notify the manufacturer in writing of the acceptability of the addition or change. If the Administrator determines that test data will be required he will notify the manufacturer to rescind the change within 5 days of receipt of the notification. The Administrator will then proceed as in § 86.077–32 (b) and (c), or § 86.077–33 (b) and (c) as appropriate.

(d) Election to produce vehicles (or engines) under this section will be deemed to be a consent to recall all vehicles (or engines) which the Administrator determines under § 86.077–32(c) do not meet applicable standards, and to cause such nonconformity to be remedied at no expense to the owner.

§ 86.077–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the standards prescribed in §§ 86.077–8 through 86.077–11, as applicable, shall, at the time of manufacture, affix a permanent, legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.077–30(a).

(1) Light duty vehicles and light duty trucks.

(i) A plastic or metal label shall be welded, riveted, or otherwise permanently attached in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer, who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label, and shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Engine tuneup specifications and adjustments, as recommended by the manufacturer in accordance with the altitude at which the vehicle is to be sold to the ultimate purchaser, including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g. idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing and valve lash (as applicable) as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(E) The statement: "This Vehicle Conforms to U.S.E.P.A. Regulations Applicable to 1977 Model Year New Motor Vehicles."

(F) The altitude at which the vehicle is intended for sale to the public as specified by a certificate of conformity under § 86.077–30.

(2) Heavy duty gasoline-fuel engines.

(i) The plastic or metal label shall be welded, bonded, or otherwise permanently attached to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Engine Exhaust Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Date of engine manufacture (month and year);

(E) Engine tuneup specifications and adjustments as recommended by the manufacturer, including idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop) and valve lash. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(F) The statement: "This Engine Conforms to U.S. Environmental Protection Agency Regulations Applicable to 1977 Model Year Gasoline-Fueled Heavy Duty Engines."

(iv) The label may be made up of one or more pieces provided that all pieces are permanently attached to the same engine part.

(3) Heavy duty Diesel engines.

(i) A plastic or metal label shall be welded, bonded, or otherwise permanently attached to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Engine Exhaust Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine family identification and model;

(D) Date of engine manufacture (month and year);

(E) Engine specification:

Advertised hp. ____ at ____ r.p.m.
Fuel rate at advertised hp. ____ m.m.3/stroke.
Valve lash ____ (inches).
Initial injection timing (if adjustable) ____.
(The information applicable to each engine is to be inserted on the appropriate line.)

(F) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations applicable to Diesel heavy duty engines.

(iv) The label may be made up of one or more pieces provided that all pieces are permanently attached to the same engine or vehicle part as applicable.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable State emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

§ 86.077–36 Submission of vehicle identification numbers.

(a) The manufacturer of any light duty vehicle or light duty truck covered by a certificate of conformity under § 86.077–30(a) shall, not later than 60 days after its manufacture, submit to the Administrator the vehicle identification number of such vehicle: Provided, that this requirement shall not apply with respect to any vehicle manufactured within any State, as defined in section 302(d) of the Act.

(b) The requirements of this section may be waived with respect to any manufacturer who provides information satisfactory to the Administrator which will enable the Administrator to identify those vehicles which are covered by a certificate of conformity.

§ 86.077–37 Production vehicles and engines.

(a) Any manufacturer obtaining certification under this part shall supply to the Administrator, upon his request, a reasonable number of production vehicles (or engines) selected by the Administrator which are representative of the engines, emission control systems, fuel systems, and transmissions offered and typical of production models available for sale under the certificate. These vehicles (or engines) shall be supplied for testing at such time and place and for such reasonable periods as the Administrator may require. Heavy duty engines supplied under this paragraph may be required to be mounted in chassis and appropriately equipped for operation on a chassis dynamometer.

(b) Light duty vehicles and light duty trucks.

(1) Any light duty vehicle or light duty truck manufacturer obtaining certification under this part shall notify the Administrator, on a quarterly basis, of the number of vehicles of each engine family-engine displacement-exhaust emission control system-fuel system-

transmission type-inertia weight class combination produced for sale in the United States during the preceding quarter. A manufacturer may elect to provide this information every 60 days instead of quarterly, to combine it with the notification required under § 86.077–34.

(2) All light duty vehicles and light duty trucks covered by a certificate of conformity under § 86.077–30(a) shall be adjusted by the manufacturer to the ignition or injection timing specification detailed in § 86.077–35(a)(1)(iii)(D).

(c) Heavy duty engines: Any heavy duty engine manufacturer obtaining certification under this part shall notify the Administrator, on a quarterly basis, of the number of engines of each engine family-engine displacement-exhaust emission control system-fuel system combination produced for sale in the United States during the preceding quarter.

§ 86.077–38 Maintenance instructions.

(a) The manufacturer shall furnish or cause to be furnished to the purchaser of each new motor vehicle (or motor vehicle engine) subject to the standards prescribed in §§ 86.077–8 through 86.077–11 as applicable, written instructions for the maintenance and use of the vehicle (or engine) by the purchaser as may be reasonable and necessary to assure the proper functioning of emission control systems.

(1) Such instructions shall be provided for those vehicle and engine components listed in Appendix VI to this part (and for any other components) to the extent that maintenance of these components is necessary to assure the proper functioning of emission control systems.

(2) Such instructions shall be in clear, and to the extent practicable, nontechnical language.

(b) The maintenance instructions required by this section shall contain a general description of the documentation which the manufacturer will require from the ultimate purchaser or any subsequent purchaser as evidence of compliance with the instructions.

(c) For gasoline-fueled light duty vehicles and light duty trucks.

(1) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under §§ 86.077–25(a)(2) or 86.077–25(b)(2) as applicable, and shall explain the conditions under which EGR system and catalytic converter maintenance is to be performed (e.g., what type of warning device is being employed and whether the device is activated by component failure or the need for periodic maintenance).

(2) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at low altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at high altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at high altitude.

(3) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at high altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at low altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at low altitude.

(d) For Diesel powered light duty vehicles and light duty trucks.

(1) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at low altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at high altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at high altitude.

(2) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at high altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at low altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at low altitude.

(e) For gasoline-fueled heavy duty engines such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.077–25(c)(2). Scheduled maintenance in addition to that performed on the durability engine under § 86.077–25(d)(2). Scheduled maintenfor reasons such as to offset the effects of operating conditions which differ from the dynamometer durability cycle or to increase the life of the engine beyond 1500 hours (or the equivalent). The instructions may schedule maintenance on a calendar time basis and/or mileage basis in addition to the engine service time basis that was followed by the manufacturer under § 86.077–25(c)(2).

(f) For Diesel heavy duty engines such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.077–25(d)(2). Scheduled maintenance in addition to that performed on the durability engine under § 86.077–25(d)(2) may be recommended for reasons such as to offset the effects of operating conditions which differ from the dynamometer durability cycle or to increase the life of the engine beyond 1,000 hours (or its equivalent). The instructions may schedule maintenance on a calendar time basis, mileage basis, engine service time basis, or combinations of each.

§ 86.077–39 Submission of maintenance instructions.

(a) The manufacturer shall provide to the Administrator, no later than the time of the submission required by § 86.077–23 a copy of the maintenance instructions which the manufacturer proposes to supply to the ultimate purchaser in accordance with § 86.077–38(a). The Administrator will review such instructions to determine whether they are reasonable and necessary to assure the proper functioning of the vehicle's (or engine's) emission control systems. The Administrator will notify the manufacturer of his determination whether such instructions are reasonable and necessary to assure the proper functioning of the emission control systems.

(b) Any revision to the maintenance instructions which will affect emissions shall be supplied to the Administrator at least 30 days before being supplied to the ultimate purchaser unless the Administrator consents to a lesser period of time

§ 86.078–8 Emission standards for 1978 light duty vehicles.

(a)(1) Exhaust emissions from 1978 model year light duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 grams per vehicle mile.

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 0.4 grams per vehicle mile.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in subpart B and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from gasoline-fueled light duty vehicles shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in subpart B and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1978 model gasoline-fueled light duty vehicle.

14. A new Subpart B is added to Part 86 and reads as follows:

Subpart B—Emission Regulations for 1977 and Later Model Year New Light Duty Vehicles and New Light Duty Trucks; Test Procedures

Sec.

86.177–1 General applicability.
86.177–2 Definitions.
86.177–3 Abbreviations.
86.177–4 Section numbering; construction.
86.177–5 Test procedures.
86.177–6 Fuel specifications.
86.177–7 Gasoline-fueled vehicle and engine preparation.
86.177–8 Vehicle preconditioning.
86.177–9 Evaporative emission collection procedure for gasoline-fueled vehicles.
86.177–10 Dynamometer driving schedule.
86.177–11 Dynamometer procedures.
86.177–12 Three-speed manual transmissions.
86.177–13 Four-speed and five-speed manual transmissions.
86.177–14 Automatic transmissions.
86.177–15 Engine starting and restarting.
86.177–16 Sampling and analytical system (exhaust emissions).

Sec.

86.177-17 Sampling analytical system (fuel evaporative emissions, gasoline-fueled vehicles).
86.177-18 Information to be recorded.
86.177-19 Analytical system calibration and sample handling.
86.177-20 Dynamometer test runs.
86.177-21 Chart reading.
86.177-22 Calculations (exhaust emissions).
86.177-23 Calculations (fuel evaporative emissions, gasoline-fueled vehicles.

AUTHORITY: Sec. 202, 206, 207, 208, and 301(a) of the Clean Air Act, as amended (42 U.S.C. 1857f-1, 1857f-5, 1857f-5a, 1857f-6, 1857g(a)).

Subpart B—Emission Regulations for 1977 and Later Model Year New Light Duty Vehicles and New Light Duty Trucks; Test Procedures

§ 86.177-1 General applicability.

The provisions of this subpart are applicable to 1977 and later model year new light duty vehicles and light duty trucks.

§ 86.177-2 Definitions.

The definitions in § 86.077-2 apply to this subpart.

§ 86.177-3 Abbreviations.

The abbreviations in § 86.077-3 apply to this subpart.

§ 86.177-4 Section numbering, construction.

(a) The section numbering procedure specified in § 86.177-4(a) applies to this subpart.

(b) Unless indicated, all provisions in this subpart apply to both gasoline-fueled and Diesel vehicles.

§ 86.177-5 Test procedures.

The procedures described in this and subsequent sections will be the test program to determine the conformity of vehicles with the standards set forth in §§ 86.077-8 and 86.077-9.

(a) Vehicles which are required to be tested for compliance with the exhaust and fuel evaporative emission standards of this subpart shall be tested according to the following procedures:

(1) The test consists of prescribed sequences of fueling, parking, and operating conditions. The exhaust gases generated during vehicle operation are diluted with air and sampled continuously for subsequent analysis of specific components by prescribed analytical techniques. The fuel evaporative emissions are collected for subsequent weighing during both vehicle parking and operating events. The test applies to vehicles equipped with catalytic or direct-flame afterburners, induction system modifications, or other systems or to uncontrolled vehicles and engines.

(2) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles. The test consists of engine startups and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix I to this part. A proportional part of the diluted exhaust emissions is collected continuously, for subsequent analysis using a constant volume (variable dilution) sampler.

(3) The fuel evaporative emission test is designed to determine fuel hydrocarbon evaporative emissions to the atmosphere as a consequence of urban driving and diurnal temperature fluctuations during parking. It is associated with a series of events representative of a motor vehicle's operation which result in fuel vapor losses directly from the fuel tank and carburetor. Activated carbon traps are employed in collecting the vaporized fuel. The test procedure is specifically aimed at collecting and weighing:

(i) Diurnal breathing losses from the fuel tank and other parts of the fuel system when the fuel tank is subjected to a temperature increase representative of the diurnal range;

(ii) Running losses from the fuel tank and carburetor resulting from a simulated trip on a chassis dynamometer; and

(iii) Hot soak losses from the fuel tank and carburetor which result when the vehicle is parked and the hot engine is turned off.

(4) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenence to correct component malfunction or failure shall be authorized in accordance with § 86.077-25.

(b) Vehicles which are required to be tested for compliance only with the exhaust emission standards of this subpart shall be tested according to the following procedures:

(1) Gasoline-fueled vehicles.

(i) The test consists of prescribed sequences of fueling, parking, and operating conditions. The exhaust gases generated during vehicle operation are diluted with air and sampled continuously for subsequent analysis of specific components by prescribed analytical techniques. The test applies to vehicles equipped with catalytic or direct-flame afterburners, induction system modifications, or other systems or to uncontrolled vehicles and engines.

(ii) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles. The test consists of engine startups and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix I to this part. A proportional part of the diluted exhaust emissions is collected continuously, for subsequent analysis, using a constant volume (variable dilution) sampler.

(iii) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.077-25.

(2) Diesel vehicles.

(i) The test consists of prescribed sequences of fueling, parking, and operating conditions. The exhaust gases generated during vehicle operation are diluted with air and sampled continuously for analysis of Diesel exhaust hydrocarbon and subsequent analysis of other specific components by prescribed techniques.

The test applies to vehicles equipped with catalytic or direct flame afterburners, other control systems or to uncontrolled vehicles and engines. All test phases are conducted with an ambient temperature range between 68° and 86° F.

(ii) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles. The test consists of engine startups and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix I to this part. Using a constant volume (variable dilution) sampler, a proportional part of the diluted exhaust gas is analyzed continuously for hydrocarbons and an additional proportional part of the diluted exhaust gas is collected in a bag for subsequent analysis of the other components.

(iii) Except for component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Component malfunction or failure shall be repaired in accordance with § 86.077-25.

§ 86.177-6 Fuel specifications.

(a) Gasoline.

(1) Gasoline having the following specifications will be used by the Administrator in exhaust and evaporative emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust and evaporative testing, except that the lead and octane specifications do not apply.

Item designation	ASTM	Leaded	Unleaded
Octane, research, minimum	D1656	100	96
Pb. (organic), grams/U.S. gallon		11.4	0.00–0.5
Distillation range:			
IBP,[1] °F	D86	75–95	75–95
10 percent point, °F	D86	120–135	120–135
50 percent point, °F	D86	200–230	200–230
90 percent point, °F	D86	300–325	300–325
EP, °F (maximum)	D86	415	415
Sulfur, weight percent, maximum	D1266	0.10	.10
Phosphorus, grams/U.S. gallon, maximum		.01	.005
RVP,[2][3] pounds	D323	8.7–9.2	8.7–9.2
Hydrocarbon composition:			
Olefins, percent, maximum	D1319	10	10
Aromatics, percent, maximum	D1319	35	35
Saturates	D1319	Remainder	Remainder

[1] For testing at altitudes above 1,219 meters (4,000 feet) the specified range is 75–105.
[2] For testing which is unrelated to fuel evaporative emission control, the specified range is 8–9.2.
[3] For testing at altitudes above 1,219 meters (4,000 feet) the specified range is 7.9–9.2.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in mileage accumulation. For unleaded gasoline the minimum lead content shall be 0.02 grams per U.S. gallon and the minimum phosphorus content shall be 0.002 grams per U.S. gallon. For leaded gasoline, the minimum lead content shall be 1.4 grams per U.S. gallon, except that where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use of a gasoline with a different lead content. The octane rating of the gasoline used shall be no higher than 4.0 research octane numbers above the minimum recommended by the manufacturer. The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel during the season which the mileage accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.077–21(b)(3).

(b) Diesel fuel.

(1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of diesel fuel recommended by the engine manufacturer commercially designated as "Type 1–D" or "Type 2–D", shall be used.

(3) Other petroleum distillation fuel specifications.

(i) Other petroleum distillate fuels may be used for testing and service accumulation provided they are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraphs (b)(1) and (b)(2) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications was provided prior to the start of testing.

(4) The specification range of the fuels to be used under paragraphs (b)(1), (b)(2), and (b)(3) of this section shall be reported in accordance with § 86.077–21(b)(3).

§ 86.177–7 Gasoline-fueled vehicle and engine preparation.

(a) Gasoline-fueled vehicles to be tested for compliance with the exhaust and fuel evaporative emissions standards of this subpart shall be prepared as follows:

(1)(i) Apply appropriate leak proof fittings to all fuel system external vents to permit collection of effluent vapors from these vents during the course of the prescribed tests. Since the prescribed test requires the temporary plugging of the inlet pipe to the air cleaner, it will be necessary to install a probe for collecting the normal effluents from this source. Where antisurge/vent filler caps are employed on the fuel tank, plug off the normal vent if it does not conveniently lend itself to the collection of vapors which emanate from it, and introduce a separate vent, with appropriate fitting on the cap. Where the fuel tank vent line terminus is inaccessible, sever the line at a convenient point near the fuel tank and install the collection system in a closed circuit assembly with the severed ends. All fittings shall terminate in 5/16-inch ID tube sections for ready connection to the collection systems and shall be designed for minimum dead space.

(ii) The design and installation of the necessary fittings shall not disturb the normal function of the fuel system components or the normal pressure relationships in the system.

(2)(i) Inspect the fuel system carefully to insure the absence of any leaks to the atmosphere of either liquid or vapor which might affect the accuracy of the test or the performance of the control system. Corrective action, if required, shall be performed in accordance with § 86.077–25 and be reported with the test results under § 86.077–23.

(ii) Care should be exercised in the application of any pressure tests, neither to purge nor load the evaporative emission control system.

(3) Prepare fuel tank for recording the temperature of the prescribed test fuel at its approximate midvolume.

(4) Provide additional fittings and adapters as required, to accommodate a fuel drain at the lowest point possible in the tank as installed on the vehicle.

(b) Gasoline-fueled vehicles to be tested for compliance only with the exhaust emission standards of this subpart shall be prepared as follows:

(1)(i) Inspect the fuel system carefully to insure the absence of any leaks to the atmosphere of either liquid or vapor which might affect the accuracy of the test or the performance of the control system. Such inspection shall include the application of a pressure of 14.5 inches of water (plus or minus 0.5 inches of water) to the fuel system. The pressure should be applied and allowed to stabilize and the fuel system isolated from the pressure source. The fuel system may not lose more than 2.0 inches of water for five minutes beginning with the isolation of the fuel system. Corrective action, if required, shall be performed in accordance with § 86.077–25 and be reported with the test results under § 86.077–23.

(ii) Care should be exercised, in the application of any pressure tests, neither to purge nor load the evaporative emission control system.

§ 86.177–8 Vehicle preconditioning.

(a) Gasoline-fueled vehicles to be tested for compliance with the exhaust and fuel evaporative emissions standard of this part shall be preconditioned as follows:

(1) The test vehicle shall be operated under the conditions prescribed for mileage accumulation, § 86.077–26, for one hour immediately prior to the operation prescribed below.

(2) The fuel tank shall be drained and specified test fuel (§ 86.177–6(a)) added. The evaporative emission control system or device shall not be abnormally purged or loaded as a result of draining or fueling the tank.

(3) The test vehicle shall be placed on the dynamometer and operated over a simulated trip, according to the applicable requirements and procedures of §§ 86.177–10 through 86.177–15 except that the engine need not be cold when starting the run on the dynamometer and only a single trip of 7.5 miles shall be run. The test vehicle may be used to set dynamometer horsepower, if necessary. During this operation the ambient temperature shall be between 68° F and 86° F.

(4) The engine and cooling fan shall be stopped upon completion of the dynamometer operation and the vehicle permitted to soak either on or off the dynamometer stand at an ambient temperature between 76° F and 86° F for a period of not less than one hour prior to the soak period prescribed in § 86.177–9(a)(1).

(b) Gasoline-fueled vehicles to be tested for compliance only with the exhaust emissions standards of this part shall be preconditioned as follows:

(1) The fuel tank(s) shall be drained and filled with the specified test fuel (§ 86.177–6(a)) to the prescribed tank(s) fuel volume, defined in § 86.077–2. The fuel added to the vehicle tank(s) shall

have an initial temperature of no more than 86°F. The evaporative emission control system or device shall not be abnormally purged or loaded as a result of draining or fueling the tank(s).

(2) The test vehicle shall be placed on the dynamometer and operated over a simulated trip, according to the applicable requirements and procedures of §§ 86.177–10 through 86.177–15 except that the engine need not be cold when starting the run on the dynamometer and only a single trip of 7.5 miles shall be run. Longer preconditioning may be permitted with advance approval of the Administrator. The test vehicle may be used to set dynamometer horsepower, if necessary. During this operation the ambient temperature shall be between 68°F and 86°F.

(3) The engine and cooling fan shall be stopped upon completion of the dynamometer operation and the vehicle permitted to soak either on or off the dynamometer stand at an ambient temperature between 76°F and 86°F for a period of not less than one hour prior to the soak period prescribed in § 86.177–9(a)(1).

(4) The test vehicle shall be allowed to soak in an area where the ambient temperature is maintained between 60°F and 86°F for a period of not less than 11 (eleven) hours prior to the dynamometer operation prescribed in §§ 86.177–10 through 86.177–20.

(5) The vehicle shall be operated on the dynamometer according to the requirements and procedures of § 86.177–20. This operation completes the test.

(c) Diesel vehicles to be tested for compliance with the exhaust emission standards of this part shall be preconditioned as follows:

(1) The fuel tank of the test vehicle shall be drained and charged with the specified test fuel, § 86.177–6(b)(2) to the prescribed "tank fuel volume," defined in § 86.077–2. The vehicle manufacturer shall provide additional fittings and adapters, as required to accommodate a fuel drain at the lowest point possible in the tank as installed on the vehicle. Test fuel, when charged to the tank shall be at ambient temperature, § 86.177–5(b)(2)(i).

(2) The test vehicle shall be placed on the dynamometer and operated over a simulated trip, according to the applicable requirements and procedures of §§ 86.177–10 through 86.177–15 except that the engine need not be cold when starting the run on the dynamometer and only a single trip of 7.5 miles shall be run. The test vehicle may be used to set dynamometer horsepower, if necessary.

(3) The engine and cooling fan shall be stopped upon completion of the dynamometer operation and the vehicle permitted to soak either on or off the dynamometer stand for a period of not less than 12 hours prior to the dynamometer test.

§ 86.177–9 Evaporative emission collection procedure for gasoline-fueled vehicles.

The standard test procedure consists of three parts described below which shall be performed in sequence and without any interruption in the test conditions prescribed.

(a) Diurnal breathing loss test. (1) The test vehicle shall be allowed to "soak" in an area where the ambient temperature is maintained between 60°F and 86°F, for a period of not less than 10 hours. (The vehicle preparation requirements of § 86.177–7 may be performed during this period.) It shall then be transferred to a soak area where the ambient temperature is maintained between 76°F and 86°F. Upon admittance to the 76°F–86°F soak area, the prescribed fuel tank thermocouple shall be connected to the recorder and the fuel and ambient temperature recorded at a chart speed of approximately 12 inches per hour (or equivalent record).

(2) The fuel tank of the prepared test vehicle, preconditioned according to § 86.177–8, shall be drained and recharged with the specified test fuel, § 86.177–6, to the prescribed "tank fuel volume," defined in § 86.077–2. The temperature of the fuel following the charge to the tank shall be 60°F±2°F. Care should be exercised against abnormal loading of the evaporative emission control system or device as a result of fueling the tank.

(3) Immediately following the fuel charge to the tank, the exhaust pipe(s) and inlet pipe to the air cleaner shall be plugged and the prescribed vapor collection systems installed on all fuel system external vents. Multiple vents may be connected to a single collection trap provided that, where there is more than one external vent on a fuel system distinguishing between carburetor and tank vapors, separate collection systems shall be employed to trap the vapors from the separate sources. Every precaution shall be taken to minimize the lengths of the collection tubing employed and to avoid sharp bends across the entire system.

(4) Artificial means shall be employed to heat the fuel in the tank to 84°F±2°F. The prescribed temperature of the fuel shall be achieved over a period of 60 minutes ±10 minutes at a constant rate of change of temperature with respect to time. After a minimum of 1 hour following admittance to the 76°F–86°F soak area, the vehicle shall be moved onto the dynamometer stand for the subsequent part of the test. The fuel tank thermocouple may be temporarily disconnected to permit moving the test vehicle. Plugs shall be removed from the exhaust pipe(s) and inlet pipe to the air cleaner.

(b) Running loss test. (1) The vehicle shall be placed on the dynamometer.

(2) Where an external vent is located such that any "running loss" emissions would be inducted into the engine, the vapor loss measurement system shall be temporarily disconnected from that vent and clamped. Vapor losses from this vent need not be measured during this part of the test.

(3) The vehicle shall be operated on the dynamometer according to the requirements and procedures of §§ 86.177–10 through 86.177–20. The engine and fan shall be turned off upon completion of the dynamometer run and the exhaust and air cleaner inlet pipes shall be replugged.

(4) Vapor losses need not be measured during the 10-minute soak or 505-second "hot" start test. Any vapor loss collection system used during the cold start shall be temporarily disconnected and clamped. At the end of the hot start test, the vapor collection systems shall be reconnected for the following phase.

(c) Hot soak test. Upon completion of the dynamometer run, the test vehicle shall be permitted to soak with hood down for a period of 1 hour at an ambient temperature between 76°F and 86°F. This operation completes the test. The traps are disconnected and weighed according to § 86.177–17.

(d) Alternate to paragraph (a) of this section: Diurnal breathing loss test. (1) The test vehicle shall be allowed to "soak" in an area where the ambient temperature is maintained between 60°F and 86°F for a period of not less than 10 hours. (The vehicle preparation requirements of § 86.177–7 may be performed during this period.) It shall then be transferred to a soak area where the ambient temperature is maintained between 76°F and 86°F.

(2) The fuel tank of the prepared test vehicle, preconditioned according to § 86.177–8, shall be drained and recharged with the specified test fuel, § 86.177–6, to the prescribed "tank fuel volume," defined in § 86.077–2. The temperature of the fuel prior to delivery to the fuel tank shall be between 50°F and 60°F. Care should be exercised against abnormal loading of the evaporative emission control system or device as a result of fueling the tank.

(3) Connect the prescribed fuel tank thermocouple to the recorder and record the fuel and ambient temperatures at a chart speed of approximately 12 inches per hour (or equivalent record). Plug the exhaust pipe(s) and inlet pipe to the air cleaner and when the fuel temperature reaches 60°F±2°F install the prescribed vapor collection systems on all fuel system external vents. Multiple vents may be connected to a single collection trap provided that, where there is more than one external vent on a fuel system distinguishing between carburetor and tank vapors, separate collection systems shall be employed to trap the vapors from the separate sources. Every precaution shall be taken to minimize the lengths of the collection tubing employed and to avoid sharp bends across the entire system.

(4) Artificial means shall be employed to heat the fuel in the tank to 84°F±2°F. The prescribed temperature of the fuel shall be achieved over a period of 60

minutes ±10 minutes at a constant rate of change of temperature with respect to time. After a minimum of 1 hour following admittance to the 76°F–86°F soak area, the vehicle shall be moved onto the dynamometer stand for the subsequent part of the test. The fuel tank thermocouple may be temporarily disconnected to permit moving the test vehicle. Plugs shall be removed from the exhaust pipe(s) and inlet pipe to the air cleaner.

§ 86.177–10 Dynamometer driving schedule.

(a) The dynamometer driving schedule to be followed consists of a nonrepetitive series of idle, acceleration, cruise, and deceleration modes of various time sequences and rates. The driving schedule is defined by a smooth transition through the speed vs. time relationships listed in Appendix I. The time sequence begins upon starting the vehicle according to the startup procedure described in § 86.177–15.

(b) The speed tolerance at any given time on the dynamometer driving schedule prescribed in Appendix I or as printed on a driver's aid chart approved by the Administrator, when conducted to meet the requirements of § 86.177–11, is defined by upper and lower limits. The upper limit is 2 m.p.h. higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 m.p.h. lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as occur when shifting manual transmission vehicles) are acceptable provided they occur for less than 2 seconds on any one occasion. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences. Further, speed deviations from those prescribed due to stalling are acceptable provided the provisions of § 86.177–15(d) are adhered to. When conducted to meet the requirements of § 86.177–8, the speed tolerance shall be as specified above, except that the upper and lower limits shall be 4 m.p.h.

§ 86.177–11 Dynamometer procedure.

(a) The dynamometer run consists of two tests, a "cold" start test after a minimum 12-hour soak (according to the provisions of §§ 86.177–8, and 86.177–9 for gasoline-fueled vehicles) and a "hot" start test with a 10-minute soak between the two tests. Engine startup (with all accessories turned off), operation over the driving schedule, and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with air to a constant volume and a portion is sampled continuously during each test. (Diesel hydrocarbons are analyzed continuously). The composite (flow integrated) samples collected in bags are analyzed for hydrocarbons, (except Diesel), carbon monoxide, carbon dioxide, and oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, and oxides of nitrogen.

(b) During the dynamometer operation, a fixed speed cooling fan shall be positioned so as to direct cooling air to the vehicle in an appropriate manner with the engine compartment cover open. The fan capacity shall normally not exceed 5,300 c.f.m. If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, the fan capacity may be increased or additional fans used if approved in advance by the Administrator. In the case of vehicles with front engine compartments, the fan(s) shall be squarely positioned between 8 and 12 inches in front of the cooling air inlets (grill). In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan(s) shall be placed in a position to provide sufficient air to maintain engine cooling.

(c) The vehicle shall be nearly level when tested in order to prevent abnormal fuel distribution.

(d) Flywheels, electrical or other means of simulating inertia as shown in the following table shall be used. If the equivalent inertia specified is not available on the dynamometer being used, the next higher equivalent inertia (not to exceed 250 lbs.) available shall be used.

Loaded vehicle weight (pounds)	Equivalent interia weight (pounds)	Road load power at 50 m.p.h. (horsepower)
Up to 1,125	1,000	5.9
1,126 to 1,375	1,250	6.5
1,376 to 1,625	1,500	7.1
1,626 to 1,875	1,750	7.7
1,876 to 2,125	2,000	8.3
2,126 to 2,375	2,250	8.8
2,376 to 2,625	2,500	9.4
2,626 to 2,875	2,750	9.9
2,876 to 3,250	3,000	10.3
3,251 to 3,750	3,500	11.2
3,751 to 4,250	4,000	12.0
4,251 to 4,750	4,500	12.7
4,751 to 5,250	5,000	13.4
5,251 to 5,750	5,500	13.9
5,751 to above	5,500	14.4

(e) Power absorption unit adjustment.

(1) The power absorption unit shall be adjusted to reproduce road load power at 50 m.p.h. true speed. The indicated road load power setting shall take into account the dynamometer friction. The relationship between road load (absorbed) power and indicated road load power for a particular dynamometer shall be determined by the procedure outlined in Appendix II or other suitable means.

(2) The road load power listed in the table above shall be used or the vehicle manufacturer may determine the road load power by an alternate procedure requested by the manufacturer and approved in advance by the Administrator, or the vehicle manufacturer may determine the road load power by the following procedure and request its use:

(i) Gasoline-fueled vehicles.

(A) Measuring the absolute manifold pressure of a representative vehicle, of the same equivalent inertia weight class, when operated on a level road under balaced wind conditions at a true speed of 50 m.p.h., and

(B) Noting the dynamometer indicated road load horsepower setting required to reproduce that manifold pressure when the same vehicle is operated on the dynamometer at a true speed of 50 m.p.h. The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e., within ±5 mm. Hg.

(C) The road load power shall be determined according to the procedure outlined in Appendix II and adjusted according to the following if applicable.

(ii) Diesel vehicles.

(A) Measuring the fuel flow rate of a representative vehicle of the same equivalent inertia weight class, when operated on a level road under balanced wind conditions at a true speed of 50 m.p.h., and

(B) Noting the dynamometer indicated road load horsepower setting required to reproduce that fuel flow rate when the same vehicle is operated on the dynamometer at a true speed of 50 m.p.h. The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e. within ±5 mm. Hg.

(C) The road load power shall be determined according to the procedure outlined in Appendix II and adjusted according to the following if applicabe.

(3) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with air conditioning, the road load power listed above or as determined in paragraph (c)(2) of this section shall be increased by 10 percent for testing all test vehicles representing such engine family if those vehicles are intended to be offered with air conditioning in production.

(f) The vehicle speed (m.p.h.) as measured from the dynamometer rolls shall be used for all conditions. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(g) Practice runs over the prescribed driving schedule may be performed at test points, provided an emission sample is not taken, for the purpose of finding the minimum accelerator pedal action to maintain the proper speed-time relationship, or to permit sampling system adjustments to comply with § 86.177–16(a)(2)(ii) or § 86.177–16(b)(2)(ii).

NOTE: When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls. The rocking of the vehicle changes the tire rolling radius on each roll. The rocking may be minimized by restraining the vehicle horizontally (or nearly so) by using a cable and winch.

(h) The drive wheel tires may be inflated up to 45 p.s.i.g. in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(i) If the dynamometer has not been operated during the 2-hour period im-

mediately preceding the test it shall be warmed up for 15 minutes by operating it at 30 m.p.h. using a nontest vehicle.

(j) If the dynamometer horsepower must be adjusted manually, it shall be set within 1 hour prior to the exhaust emissions test phase. The test vehicle shall not be used to make this adjustment. Dynamometers using automatic control of preselectable power settings may be set anytime prior to the beginning of the emissions test.

§ 86.177–12 Three-speed manual transmissions.

(a) All test conditions except as noted shall be run in highest gear.

(b) Cars equipped with free wheeling or overdrive units shall be tested with this unit (free wheeling or overdrive) locked out of operation.

(c) Idle shall be run with transmission in gear and with clutch disengaged (except first idle; see § 86.177–15).

(d) The vehicle shall be driven with minimum accelerator pedal movement to maintain the desired speed.

(e) Acceleration modes shall be driven smoothly with the shift speeds as recommended by the manufacturer. If the manufacturer does not recommend shift speeds, the vehicle shall be shifted from first to second gear at 15 m.p.h. and from second to third gear at 25 m.p.h. The operator shall release the accelerator pedal during the shift, and accomplish the shift with minimum closed throttle time. If the vehicle cannot accelerate at the specified rates, the vehicle shall be operated with accelerator pedal fully depressed until the vehicle speed reaches the speed at which it should be at that time during the test.

(f) The deceleraton modes shall be run with clutch engaged and without shifting gears from the previous mode, using brakes or accelerator pedal as necessary to maintain the desired speed. For those modes which decelerate to zero, the clutch shall be depressed when the speed drops below 15 m.p.h., when engine roughness is evident, or when engine stalling is imminent.

(g) Downshifting is allowed at the beginning of or during a power mode if recommended by the manufacturer or if the engine obviously is lugging.

§ 86.177–13 Four-speed and five-speed manual transmissions.

(a) Use the same procedure as for three-speed manual transmissions for shifting from first to second gear and from second to third gear. If the manufacturer does not recommend shift speeds, the vehicle shall be shifted from third to fourth gear at 40 m.p.h. Fifth gear may be used at the manufacturer's option.

(b) If transmission ratio in first gear exceeds 5:1, follow the procedure for three- or four-speed manual transmission vehicles as if the first gear did not exist.

§ 86.177–14 Automatic transmissions.

(a) All test conditions shall be run with the transmission in "Drive" (highest gear). Automatic stick-shift transmissions may be shifted as manual transmissions at the option of the manufacturer.

(b) Idle modes shall be run with the transmission in "Drive" and the wheels braked (except first idle; see § 86.177–15).

(c) The vehicle shall be driven with minimum accelerator pedal movement to maintain the desired speed.

(d) Acceleration modes shall be driven smoothly allowing the transmission to shift automatically through the normal sequence of gears. If the vehicle cannot accelerate at the specified rates, the vehicle shall be operated with accelerator pedal fully depressed until the vehicle speed reaches the speed at which it should be at that time during the driving schedule.

(e) The deceleration modes shall be run in gear using brakes or accelerator pedal as necessary to maintain the desired speed.

§ 86.177–15 Engine starting and restarting.

(a) Gasoline-fueled vehicles. Paragraph (a) of this section applies to gasoline-fueled vehicles.

(1) The engines shall be started according to the manufacturer's recommended starting procedures. The initial 20-second idle period shall begin when the engine starts.

(2) Choke operation.

(i) Vehicles equipped with automatic chokes shall be operated according to the instructions which will be included in the manufacturer's operating instructions or owner's manual including choke setting and "kick-down" from cold fast idle. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(ii) Vehicles equipped with manual chokes shall be operated according to the manufacturer's operating instructions or owner's manual.

(3) The operator may use the choke, accelerator pedal, etc. where necessary to keep the engine running.

(4) If the manufacturer's operating or owner's manual does not specify a warm engine starting procedure, the engine (automatic and manual choke engines) shall be started by depressing the accelerator pedal about half way and cranking the engine until it starts.

(b) Diesel vehicles. Paragraph (b) of this section applies to Diesel vehicles.

(1) The engine shall be started according to the manufacturer's recommended starting procedures. The initial 20-second idle period shall begin when the engine starts. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(c) If the vehicle does not start after 10 seconds of cranking, cranking shall cease and the reason for failure to start shall be determined. The revolution counter on the constant volume sampler (and the hydrocarbon integrator when testing Diesel vehicles, see § 86.177–20) shall be turned off and the sample solenoid valves placed in the "dump" position during this diagnostic period. In addition, either the positive displacement pump should be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start. If failure to start is caused by vehicle malfunction, corrective action of less than 30 minutes duration may be taken and the test continued. The sampling system shall be reactivated at the same time cranking is started. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

(d) If the engine "false starts", the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.)

(e) Stalling.

(1) If the engine stalls during an idle period, the engine shall be restarted immediately and the test continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the vehicle restarts the driving schedule indicator shall be reactivated.

(2) If the engine stalls during some operating mode other than idle, the driving scheduled indicator shall be stopped, the vehicle restarted, accelerated to the speed required at that point in the driving schedule and the test continued.

(3) If the vehicle will not restart within 1 minute, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

§ 86.177–16 Sampling and analytical system (exhaust emissions).

(a) *Gasoline-fueled vehicles.* The sampling and analytical systems for gasoline-fueled vehicles shall comply with paragraph (a) of this section:

(1) Schematic drawings. The following figures (Figs. B77–1 and B77–2) are schematic drawings of the exhaust gas sampling and analytical systems which will be used for testing under the regulations in this part. Since various configurations of the required components can produce accurate results, these schematic drawings are not to be interpreted literally and exact conformance is not mandatory. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

(2) Component description (exhaust gas sampling system). The following components will be used in the exhaust gas sampling systems for testing under the regulations in this subpart. See figure B77–1. Other types of constant volume samplers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

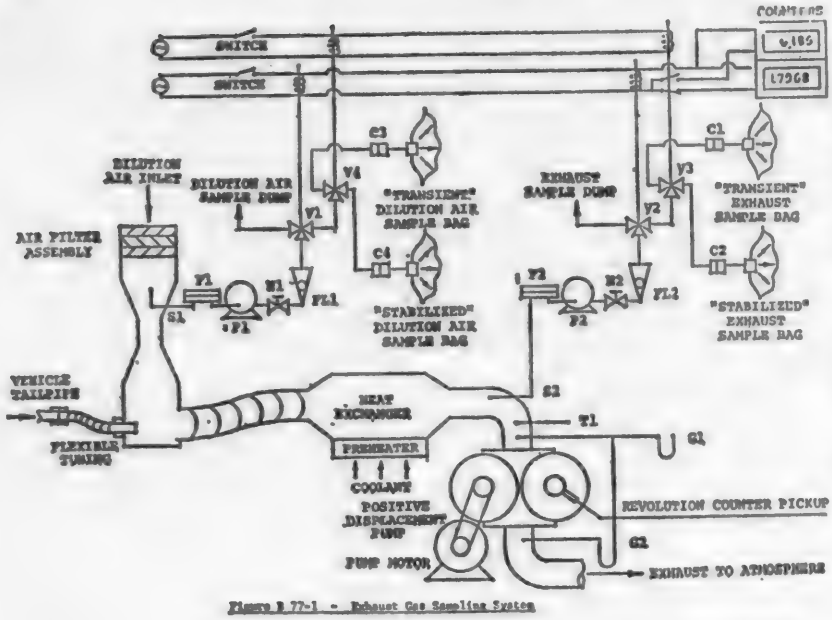

Figure B 77-1 - Exhaust Gas Sampling System

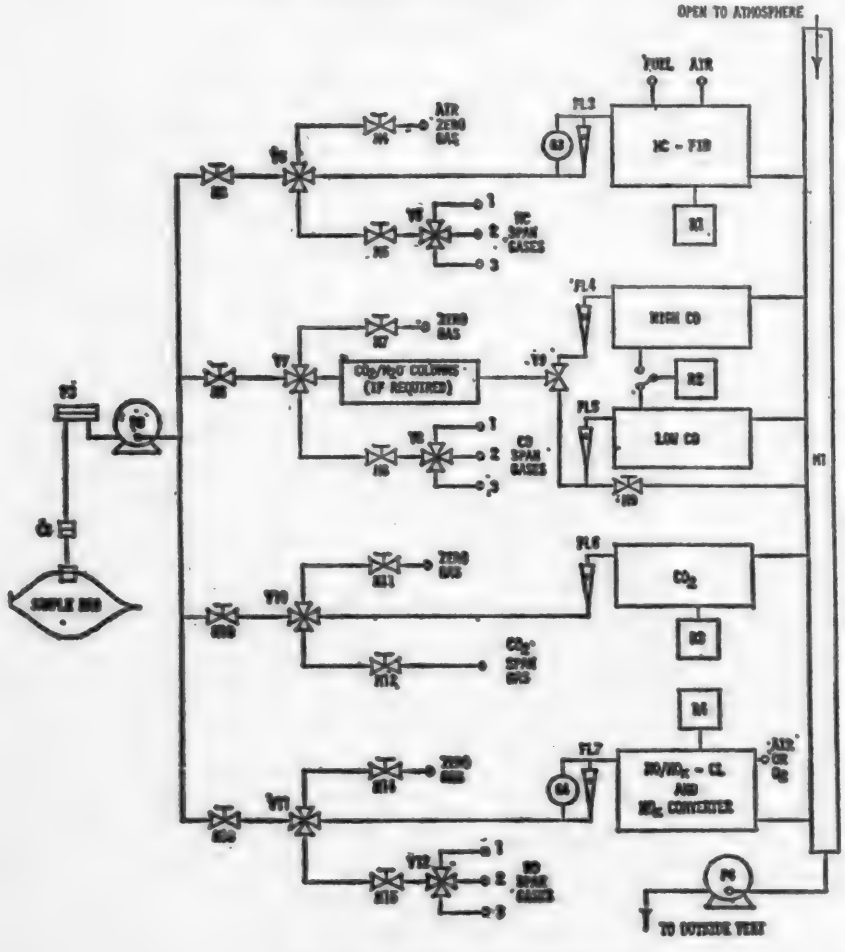

Figure B 77-2 Exhaust Gas Analytical System

(i) A dilution air filter assembly consisting of a particulate (paper) filter to remove solid matter from the dilution air and thus increase the life of the charcoal filter; a charcoal filter to reduce and stabilize the background hydrocarbon level; and a second particulate filter to remove charcoal particles from the air stream.

(ii) A leak-tight connector and tube to the vehicle tailpipe. The tubing shall be sized and connected in such a manner that the static pressure variations in the vehicle tailpipe(s) remain within ±5 inches of water of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). Sampling systems capable of tolerances of ±1 inch of water will be used by the Administrator if a written request by the manufacturer substantiates the need for this closer tolerance.

(iii) A heating system to preheat exchanger to within ±10°F of its operating temperature before the test begins.

(iv) A heat exchanger capable of limiting the gas mixture temperature variation during the entire test to ±10°F as measured at a point immediately ahead of the positive displacement pump.

(v) A positive displacement pump to pump the dilute exhaust mixture. The pump capacity (300 to 350 c.f.m. is sufficient for testing most vehicles) shall be large enough to virtually eliminate water condensation in the system. See Appendix III for one flow calibration technique. Other suitable calibration techniques may be used if approved in advance by the Administrator.

(vi) Temperature sensor (T1) with an accuracy of ±2°F to allow continuous recording of the temperature of the dilute exhaust mixture entering the positive displacement pump. (See § 86.177-18(1)).

(vii) Gauge (G1) with an accuracy of ±3 mm. Hg to measure the pressure depression of the dilute exhaust mixture entering the positive displacement pump, relative to atmospheric pressure.

(viii) Gauge (G2) with an accuracy of ±3 mm. Hg to measure the pressure increase across the positive displacement pump.

(ix) Sample probes (S1 and S2) pointed upstream to collect samples from the dilution airstream and the dilute exhaust mixture.

(x) Filters (F1 and F2) to remove particulate matter from dilution air and dilute exhaust samples.

(xi) Pumps (P1 and P2) to pump the dilution air and dilute exhaust into their respective sample collection bags.

(xii) Flow control valves (N1 and N2) to regulate flows to sample collection bags, at constant flow rates. The minimum sample flow rate shall be 10 c.f.h.

(xiii) Flowmeters (FL1 and FL2) to insure, by visual observation, that constant flow rates are maintained throughout the test.

(xiv) Three-way solenoid valves (V1, V2, V3, and V4) to direct sample streams to either their respective bags or overboard.

(xv) Quick-connect, leak-tight fittings (C1, C2, C3, and C4) with automatic shutoff on bag side to attach sample bags to sample system.

(xvi) Sample collection bags for dilution air and exhaust samples of sufficient capacity so as not to impede sample flow.

(xvii) Revolution counters to count the revolutions of the positive displacement pump while each test phase is in progress and samples are being collected.

(3) Component description (exhaust gas analytical system). The following components will be used in the exhaust gas analytical system for testing under the regulations in this part. The analytical system provides for the determination of hydrocarbon concentrations by flame ionization detector (FID) analysis, the determination of carbon monoxide and carbon dioxide concentrations by nondispersive infrared (NDIR) analysis and the determination of oxides of nitrogen concentrations by chemiluminescence (CL) analysis in dilute exhaust samples. The chemiluminescence method of analysis requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. See Appendix V. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure B77-2.

(i) Quick-connect leak-tight fitting (C5) to attach sample bags to analytical system.

(ii) Filter (F3) to remove any residual particulate matter from the collected sample.

(iii) Pump (P3) to transfer samples from the sample bags to the analyzers.

(iv) Selector valves (V5, V6, V7, V8, V9, V10, V11, and V12) for directing samples, span gases or zeroing gases to the analyzers.

(v) Flow control valves (N3, N4, N5, N6, N7, N8, N9, N10, N11, N12, N13, N14, and N15) to regulate the gas flow rates.

(vi) Flowmeters (FL3, FL4, FL5, FL6, and FL7) to indicate gas flow rates.

(vii) Pressure gauges (G3 and G4) to facilitate greater precision in setting and reading flowrates.

(viii) Manifold (M1) to collect the expelled gases from the analyzers.

(ix) Pump (P4) to transfer expelled gases from the collection manifold to a vent external to the test room (optional).

(x) Analyzers to determine hydrocarbon, carbon monoxide, carbon dioxide and oxides of nitrogen concentrations. See § 86.177-19(a).

(xi) Sample conditioning column containing $CaSO_4$ or indicating silica gel to remove water vapor and containing ascarite to remove carbon dioxide from the CO analysis stream.

NOTE: If CO instruments which are essentially free of CO2 and water vapor interference are used, the use of the conditioning column may be deleted. See § 86.177-18(h) and 86.177-22(c). A CO instrument will be considered to be essentially free of CO2 and water vapor interference if its response to a mixture of 3 percent CO2 and N2, which has been bubbled through water at room temperature (68°-86°F), produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on instrument ranges above 300 ppm CO or less than 3 ppm on instrument ranges below 300 ppm CO.

(xii) Recorders (R1, R2, R3, and R4) or digital printers to provide permanent records of calibration, spanning and sample measurements; or in those facilities where computerized data acquisition systems are incorporated, the computer facility printout may be used.

(b) Diesel vehicles. The sampling and analytical systems for exhaust emissions tests on Diesel light duty vehicles and Diesel light duty trucks shall comply with paragraph (b) of this section:

(1) Schematic drawings. The following figures B77-3, B77-4 and B77-5 are schematic drawings of the exhaust gas sampling and analytical systems which will be used for testing under the regulations in this part. Since various configurations of the required components can produce accurate results, these schematic drawings are not to be interpreted literally and exact conformance is not mandatory. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

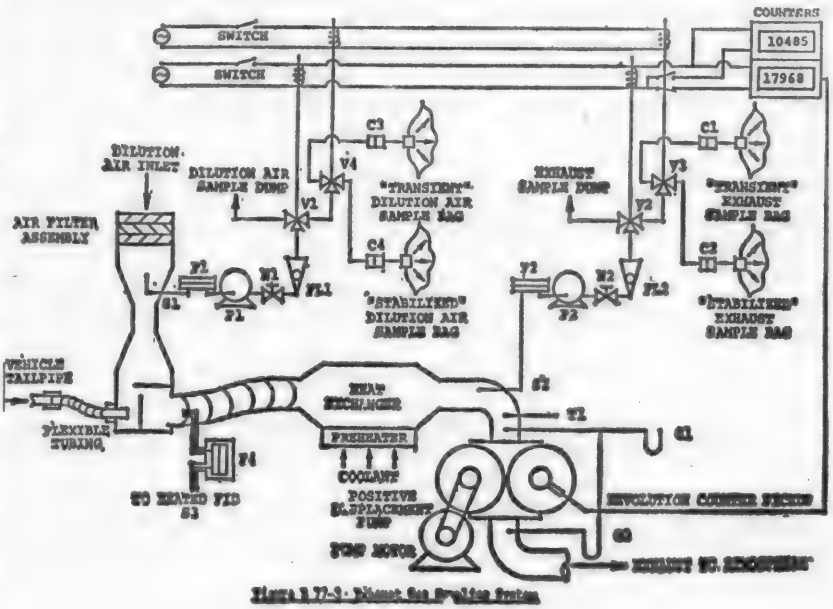

FIGURE B77-2—Diesel Gas Sampling System

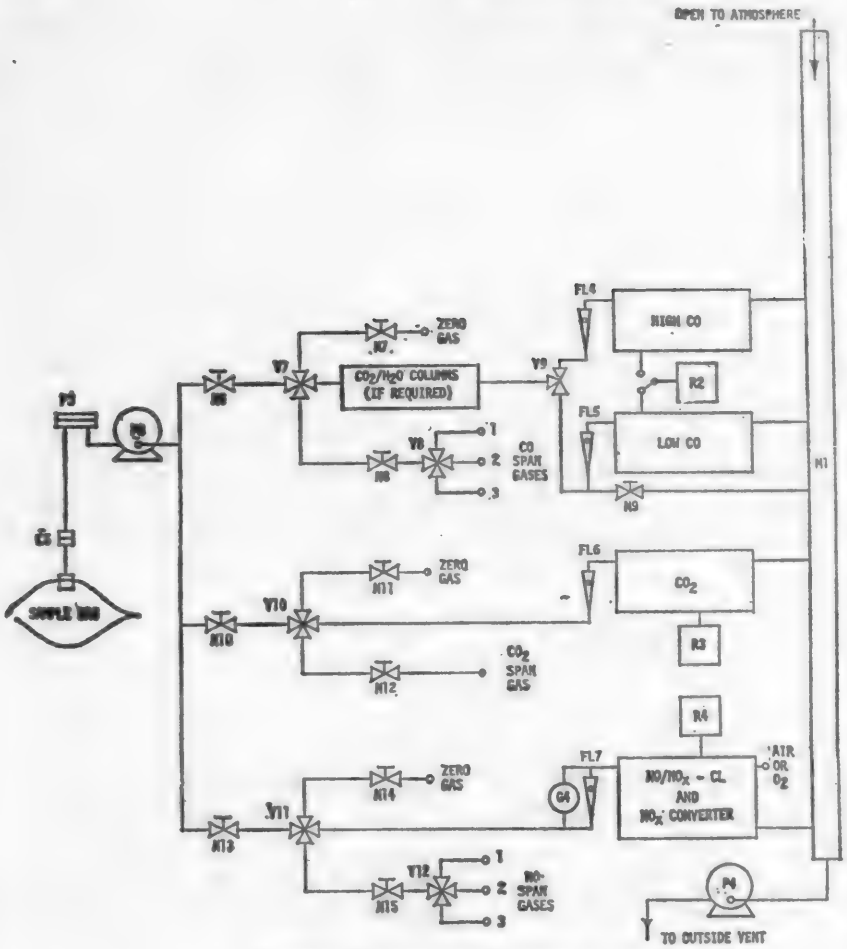

Figure B 77-4 Exhaust Gas Analytical System

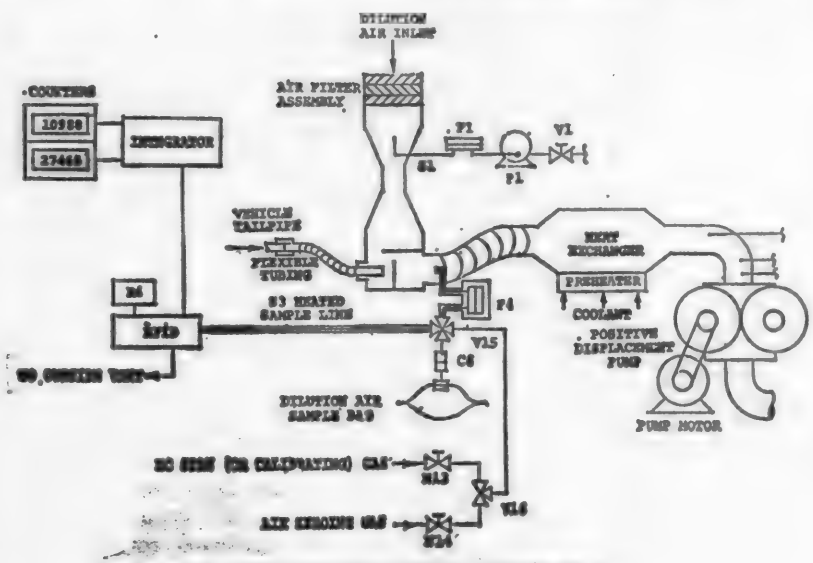

Figure B 77-5 Diesel Hydrocarbon Continuous Analysis System

(2) Component description (exhaust gas sampling system). The following components will be used in the exhaust gas sampling system for testing under the regulations in this part. See Figure B77–3. Other types of constant volume samplers may be used if shown to yield equivalent results, and if approved in advance by the Administrator.

(i) A dilution air filter assembly consisting of a particulate (paper) filter to remove solid matter from the dilution air and thus increase the life of the charcoal filter; a charcoal filter to reduce and stabilize the background hydrocarbon level; and a second particulate filter to remove charcoal particles from the air stream.

(ii) A leak-tight connector and tube to the vehicle tailpipe. The tubing shall be sized and connected in such a manner that the static pressure variations in the vehicle tailpipe(s) remain within ±5 inches of water of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). Sampling systems capable of tolerances of ±1 inch of water will be used by the Administrator if a written request by the manufacturer substantiates the need for this closer tolerance.

(iii) A heating system to preheat the heat exchanger to within ±10°F of its operating temperature before the test begins.

(iv) A heat exchanger capable of limiting the gas mixture temperature variation during the entire test to ±10°F as measured at a point immediately ahead of the positive displacement pump.

(v) A positive displacement pump to pump dilute exhaust mixture. The pump capacity (300 to 350 c.f.m. is sufficient for testing most vehicles) shall be large enough to virtually eliminate water condensation in the system. See Appendix III to this part for one flow calibration technique. Other suitable calibration techniques may be used if approved in advance by the Administrator.

(vi) Temperature sensor (T1) with an accuracy of ±2°F to allow continuous recording of the temperature of the dilute exhaust mixture entering positive displacement pump. (See § 86.177–18(1)).

(vii) Gage (G1) with an accuracy of ±3mm. Hg to measure the pressure depression of the dilute exhaust mixture entering the positive displacement pump, relative to atmospheric pressure.

(viii) Gage (G2) with an accuracy of ±3mm. Hg to measure the pressure increase across the positive displacement pump.

(ix) Sample probes (S1, S2, and S3) pointed upstream to collect samples from the dilution air steam and the dilute exhaust mixture. Additional sample probes may be used, for example, to obtain continuous concentration traces of the dilute exhaust stream. In such case the sample flow rate, in standard cubic feet per test phase, must be added to the calculated

dilute exhaust volume. The position of the sample probes in Figure B77–3 is pictorial only. The heated sample line (S3) between the sampling point and the analyzer shall be as short as possible.

(x) Filters (F1 and F2) to remove particulater matter from dilution air and dilute exhaust samples.

(xi) Pumps (P1 and P2) to pump the dilution air and dilute exhaust into their respective sample collection bags.

(xii) Flow control valves (N1 and N2) to regulate flows to sample collection bags, at constant flow rates. The minimum sample flow rate shall be 10 c.f.h.

(xiii) Flowmeters (FL1 and FL2) to insure, by visual observation, that constant flow rates are maintained throughout the test.

(xiv) Three-way solenoid valves (V1, V2, V3, and V4) to direct sample streams to either their respective bags or overboard.

(xv) Quick-connect, leak-tight fittings (C1, C2, C3, and C4) with automatic shutoff on bag side to attach sample bags to sample system.

(xvi) Sample collection bags for dilution air and exhaust samples of sufficient capacity so as not to impede sample flow.

(xvii) Revolution counters to count the revolutions of the positive displacement pump while each test phase is in progress and samples are being collected.

(3) Component description (exhaust gas batch analytical system). The following components will be used in the exhaust gas batch analytical system for testing under the regulations in this part. The analytical system provides for the determination of carbon monoxide and carbon dioxide concentrations by nondispersive infrared (NDIR) analysis and the determination of oxides of nitrogen concentrations by chemiluminescence (CL) analysis in dilute exhaust samples. The chemiluminescence method of analysis requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other type of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure B77–4.

(i) Quick-connect, leak-tight fitting (C5) to attach sample bags to analytical system.

(ii) Filter (F3) to remove any residual particulate matter from the collected sample.

(iii) Pump (P3) to transfer samples from the sample bags to the analyzers.

(iv) Selector valves (V7, V8, V9, V10, V11, and V12) for directing samples, span gases or zeroing gases to the analyzers.

(v) Flow control valves (N6, N7, N8, N9, N10, N11, N12, N13, N14, and N15) to regulate the gas flow rates.

(vi) Flowmeters (FL4, FL5, FL6, and FL7) to indicate gas flow rates.

(vii) Pressure gauge (G4) to facilitate greater precision in setting and reading flow rate.

(viii) Manifold (M1) to collect the expelled gases from the analyzers.

(ix) Pump (P4) to transfer expelled gases from the collection manifold to a vent external to the testroom (optional).

(x) Analyzers to determine carbon monoxide, carbon dioxide and oxides of nitrogen concentrations (See § 86.177–19 (a)).

(xi) Sample conditioning column containing $CaSO_4$, or indicating silica gel to remove water vapor and containing ascraite to remove carbon dioxide from the CO analyses stream.

NOTE: If CO instruments which are essentially free of CO2 and water vapor interference are used, the use of the conditioning column may be deleted. See §§ 86.177–18(n) and 86.177–22(c).

A CO instrument will be considered to be essentially free of CO2 and water vapor interference if its response to a mixture of 3 percent CO2 in N2, which has been bubbled through water at room temperature (68°–86°F), produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on instrument ranges above 300 ppm CO or less than 3 ppm on instrument ranges below 300 ppm CO.

(xii) Recorders (R1, R2, and R3) or digital printers to provide permanent records of calibration, spanning and sample measurements; or in those facilities where computerized data acquisition systems are incorporated, the computer facility printout may be used.

(4) Component description (exhaust gas continuous analytical system). The following components will be used in the exhaust gas continuous analytical system for testing under the regulations in this part. This analytical system provides for the continuous determination of exhaust hydrocarbon concentration by heated flame ionization detector (HFID) analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure B77–5.

(i) Heated continuous sampling line (S3).

(ii) Heated filter (F4) to remove particulate matter from heated hydrocarbon sample.

(iii) Selector valves (V5 and V6) for directing the continuous dilute exhaust sample, dilution air bag sample, span or zeroing gases to the analyzers.

(iv) Quick-connect, leak-tight fitting (C6) to attach dilution air sample bag to analytical system.

(v) Heated hydrocarbon analyzer (HFID) complete with heated pump, filter, and flow control system. The response time of this instrument shall be less than 1 second for 90 percent of full scale response. Sample transport time from sampling point to inlet of instrument shall be less than 4 seconds.

(vi) Chart recorder (R1) and analog integrator with two readouts, or chart recorder (R1) and on-line digital computer for manual or electronic integration of analyzer output signal during the three operating phases of the test.

(vii) Flow control valves (N4 and N5) to regulate the gas flow rates.

§ 86.177–17 Sampling and analytical system (fuel evaporative emissions, gasoline-fueled vehicles).

(a) *Schematic drawing.* (1) The following figures (Figures B77–6, B77–7, B77–8) are flow diagrams of typical evaporative loss collection applications.

(2) Figure B77–6 represents an arrangement for collecting losses which emanate from the carburetor. Figure B77–7 depicts the means for separately collecting the vapors which emanate from the fuel tank vent line and filler cap. Figure B77–8 shows an arrangement for collecting the losses from a closed fuel system, vented to the atmosphere solely through the air cleaner, as might be the case with certain fuel evaporative emission control devices.

(3) Schematic drawings of arrangements to be employed shall be submitted in accordance with § 86.077–21(b)(3).

(b) *Collection equipment.* The following equipment shall be used for this collection of fuel evaporative emissions. (Item quantities are determined by individual test needs.)

(1) *Activated carbon trap.* See Figure B77–9 for specifications of one design; other configurations may be used: Provided, That they give demonstrably equivalent results.

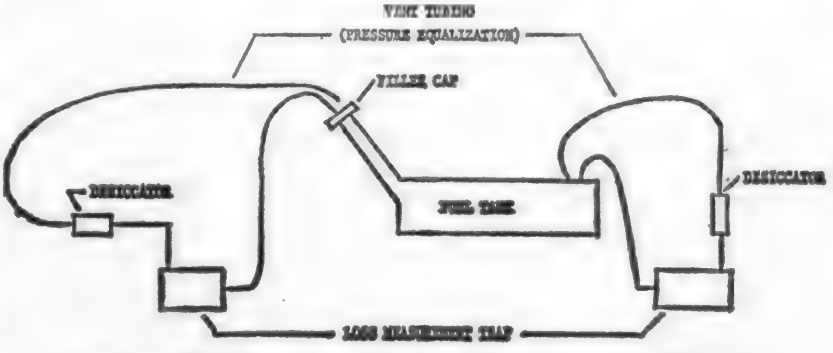

FIGURE B 77-9 — Typical fuel tank evaporative loss collection arrangement (schematic).

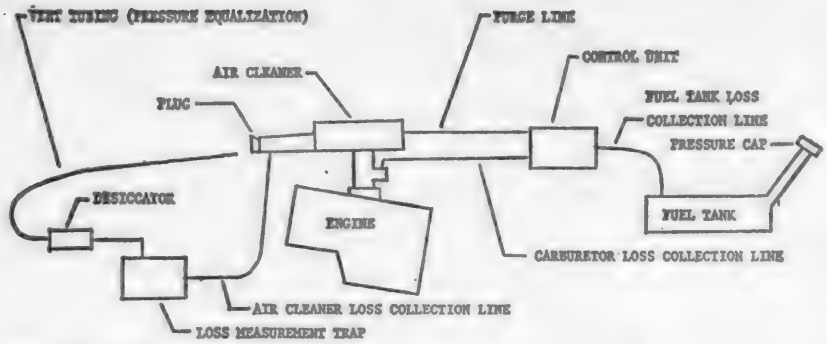

FIGURE B 77-8 - Typical fuel evaporative loss collection arrangement for vehicle equipped with evaporative emission control system (schematic).

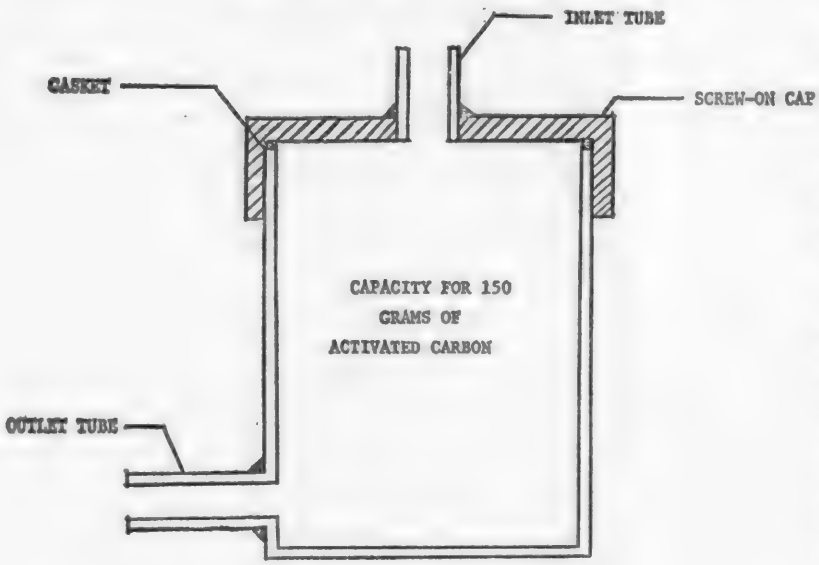

FIGURE B 77-9 - Typical activated carbon trap (schematic).

(i) Canister —300±25 ml., cylindrical container having a length to diameter ratio of 1.4+0.1. An inlet tube, 5/16-inch ID and 1 inch long is sealed into the top of the canister, at its geometric center. A similar outlet tube is sealed into the wall ¼ inch from the bottom of the canister. The canister is designed to withstand an air pressure of 2 p.s.i., when sealed, without evidence of leaking when immersed in water for 30 seconds.

(ii) Activated carbon-meeting the following specifications:

Surface area, min. (N2 BET method),[1] 1,000 square meters per gram.

Adsorption capacity, min. (carbon tetrachloride), 60 percent, by weight.

Volatile material including adsorbed water vapor, None.

Screen analysis size:	Percent
Less than 1.4 mm	0
1.7 to 2.4 mm	90–100
More than 3 mm	0

[1] Brunauer, Emmett & Teller: Journal of the American Chemical Society, Vol. 60, p. 309, 1938.

The activated carbon trap is prepared for the test by attaching clamped sections of vinyl tubing to the inlet and outlet tubes of the canister. The canister is then filled with 150±10 gm. hot activated carbon which had previously been oven-dried for 3 hours at 300° F. Loss of carbon through the inlet and outlet tubes is prevented through the use of wire screens of 0.7 mm. mesh or wads of loosely packed glass wool. The canister is closed immediately after filling and the carbon is allowed to cool while the trap is vented through a drying tube via the unclamped outlet arm.

(iii) The trap is sealed and weighed after cooling and the weight, to the nearest 0.1 gram, is inscribed on the canister body. Within 12 hours of the scheduled test, the weight of the trap is checked and if it has changed by more than 0.5 gm., it is redried to constant weight. This redrying operation is performed by passing dry nitrogen, heated to 275° F, through the trap, via the inlet tube, at a rate of 1 liter per minute until checks made at 30-minute intervals do not vary by more than 0.1 percent of the gross weight. The trap and its contents are allowed to cool to room temperature, while vented through a drying tube via the outlet arm, before use.

(2) *Auxiliary collection equipment.*

(i) Drying tube—transparent, tubular body ¾-inch ID, 6 inches long, with serrated tips and removable caps.

(ii) Desiccant—indicating variety, 8 mesh. The drying tube is attached to the outlet tube of the collection traps to prevent ambient moisture from entering the trap. It is prepared by filling the empty drying tube with fresh desiccant using a loose wad of glass wool to hold the desiccant in place. The desiccant is renewed when three-quarters spent, as indicated by color change.

(iii) Collection tubing—stainless steel, aluminum, or other suitable material approved by the Administrator, 5/16-inch ID, for connecting the collection traps to the fuel system vents.

(iv) Polyvinyl chloride (vinyl) tubing—flexible tubing, 5/16-inch ID, for sealing butt-to-butt joints.

(v) Laboratory tubing—air tight flexible tubing 5/16-inch ID, attached to the outlet end of the drying tubes to equalize collection system pressure.

(vi) Clamps—hosecock, openside, for pinching off flexible tubing.

(c) *Weighing equipment.* The balance and weights used shall be capable of determining the net weight of the activated carbon trap within an accuracy of ±75 mg.

(d) *Temperature measuring equipment.* (1) Temperature recorder—multichannel, variable speed, potentiometric, or substantially equivalent, recorder with a temperature range of 50° F, to 100° F, and capable of either simultaneous or sequential recording of the ambient air and fuel temperatures within an accuracy of ±1° F.

(2) Fuel tank thermocouples—iron-constantan (type J) construction.

(3) Other types of temperature sensing systems may be provided by the manufacturer if they record the information specified in paragraph (d) (1) of this section with the required accuracy and if they are self-contained. Type J thermocouples are required for compatibility with recording instruments used in Federal certification facilities.

(e) *Assembly and use of the activated carbon vapor collection system.* (1) The prepared activated carbon trap, dried to constant weight, cooled to the ambient temperature and sealed with clamped sections of vinyl tubing is carefully weighed to the nearest 20 milligrams and the weight recorded as the "tare weight."

(2) A drying tube is attached to the outlet tube and the clamp released, but not removed. A length of flexible tubing, for pressure equalization, is connected to the other end of the drying tube.

(3) The inlet of the adsorption trap and external vent(s) of the fuel system will be connected by minimal lengths of stainless steel or aluminum tubing and short sections of vinyl tubing. Butt-to-butt joints shall be made wherever possible and precautions taken against sharp bends in the connection lines, including

any manifold systems employed to connect multiple vents to a single trap.

(4) The clamp on the inlet tube of the trap shall be released but not removed. Care shall be exercised to prevent heating the vapor collection trap by radiant or conductive heat from the engine.

(5) Upon completion of the collection sequence, the vinyl tubing sections on each arm of the collection trap shall be clamped tight and the collection system dismantled.

(6) The sealed vapor collection trap shall be weighed carefully to the nearest 20 milligrams. This constitutes the "gross weight," which is appropriately recorded. The difference between the "gross weight" and "tare weight" represents the "net weight" for purposes of calculating the fuel vapor losses.

§ 86.177–18 Information to be recorded.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) Vehicle: Make—Vehicle identification number—Model year—Transmission type—Odometer reading—Engine displacement—Engine family—Idle r.p.m.—Fuel system (fuel injection, nominal fuel tank capacity, fuel tank location, number of carburetors, number of carburetor barrels, as applicable)—Inertia loading—Actual curb weight recorded at 0 miles—Actual road load horsepower at 50 m.p.h. and drive wheel tire pressure.

(g) Indicated road load power absorption at 50 m.p.h. and dynamometer serial number. As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided, the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning—gain—serial number—detector number—range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature, and humidity.

NOTE: A central laboratory barometer may be used, provided, that individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(k) Fuel temperatures, as prescribed (gasoline fueled only).

(l) Pressure of the mixture of exhaust and dilution air entering the positive displacement pump, the pressure increase across the pump, and the temperature set point of the temperature control system. The sample temperature at the inlet to the pump may be measured, if desired, to verify that the temperature variations are within 5° F. of the set point.

(m) The number of revolutions of the positive displacement pump accumulated while the test is in progress and exhaust flow samples are being collected.

(n) The humidity of the dilution air.

NOTE: If conditioning columns are not used (see § 86.177–16(a)(3)(xi) and § 86.177–16(b)(3)(xi)), this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(o) Temperature set point of the heated sample line and heated hydrocarbon detector temperature control system (for Diesel vehicles only).

§ 86.177–19 Analytical system calibration and sample handling.

(a) Calibrate the analytical assembly at least once every 30 days. Use the same flow rate as when analyzing samples.

(1) Adjust analyzers to optimize performance. For Diesel vehicles, operate the heated hydrocarbon analyzer, sampling line and filter to ±10° F in the temperature range of 300 to 390°F.

(2) Zero the hydrocarbon analyzer with zero grade air and the carbon monoxide, carbon dioxide, and oxides of nitrogen analyzers with zero grade air or zero grade nitrogen. The allowable zero gas impurity concentrations should not exceed 1 p.p.m. equivalent carbon response, 1 p.p.m. carbon monoxide, 400 p.p.m. (0.04 mole percent) carbon dioxide, and 0.1 p.p.m. nitric oxide.

(3) Set the CO and CO2 analyzer gains to give the desired ranges. Select the desired attenuation scale of the HC analyzer, set the sample capillary flow rate by adjusting the back pressure regulator, and adjust the electronic gain control, if provided, to give the desired range. Select the desired scale of the NOx analyzer and adjust the phototube high voltage supply or amplifier gain to give the desired range.

(4) Calibrate the HC analyzer with propane (air diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. Calibrate the CO analyzer with carbon monoxide (nitrogen diluent) gases and the CO2 analyzer with carbon dioxide (nitrogen diluent) gases having nominal concentrations equal to 10, 25, 40, 50, 60, 70, 85, and 100 percent of full scale. Calibrate the NOx analyzer with nitric oxide (nitrogen diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. The actual concentrations should be known to within ±2 percent of the true values.

(5) Compare values obtained on the CO and CO2 analyzers with previous calibration curves. Any significant change reflects some problem in the system. Locate and correct problem, and recalibrate. Use best judgement in selecting curves for data reduction.

(6) NOx converter efficiency determination: The apparatus described and illustrated in Figure B 77–10 or Figure B 77–11 is to be used to determine the conversion efficiency of devices that convert NOx to NO. The following procedure is to be used for determining the values to be used in Equation (A).

(i) Attach the NO/N2 supply (150–250 p.p.m.) at C2, the 02 supply at C1 and the analyzer inlet connection to the efficiency detector at C3. If lower concentrations of NO are used, air may be used in place of 02 to facilitate better control of the NO2 generated during step (iv).

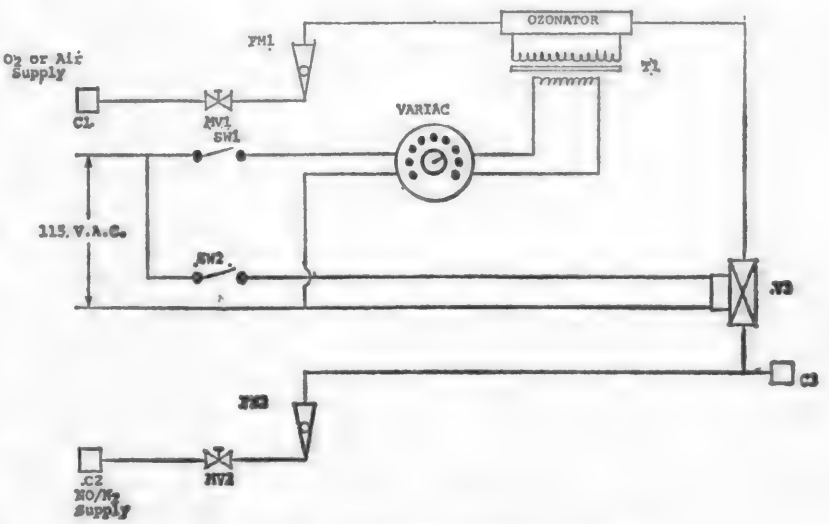

Figure B 77-10 – NOx Converter Efficiency Detector

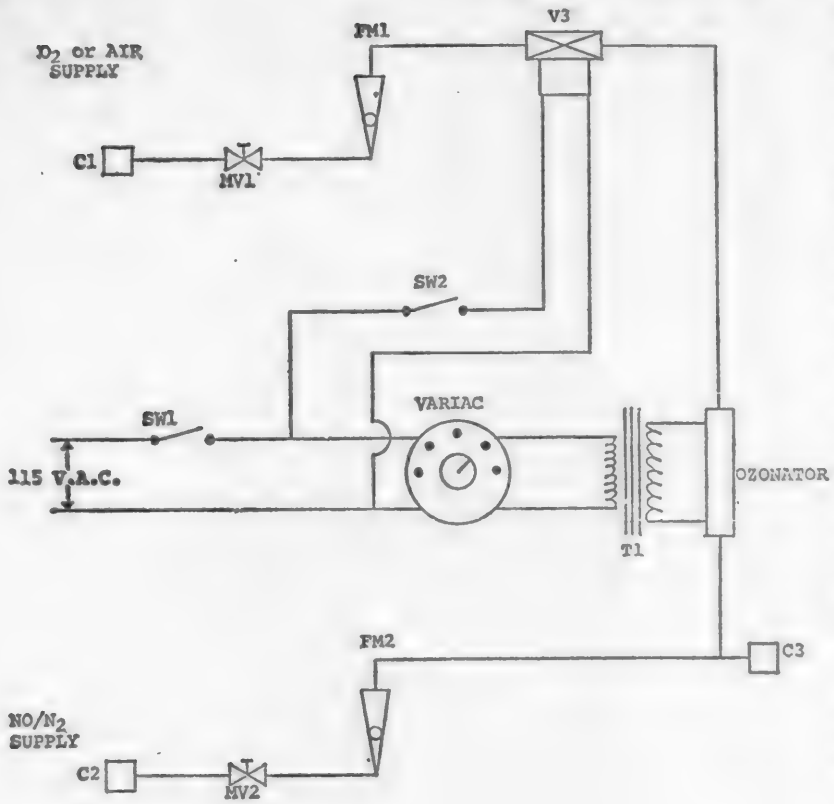

Figure B 77-11 - NOx Converter Efficiency Detector

(ii) With the efficiency detector variac off, place the NOx converter in bypass mode and close valve V3. Open valve MV2 until sufficient flow and stable readings are obtained at the analyzer. Zero and span the analyzer output to indicate the value of the NO concentration being used. Record this concentration.

(iii) Open valve V3 (on/off flow control solenoid valve for 02) and adjust valve MV1 (02 supply metering valve) to blend enough 02 to lower the NO concentration (ii) about 10 percent. Record this concentration.

(iv) Turn on the ozonator and increase its supply voltage until the NO concentration of (iii) is reduced to about 20 percent of (ii). NO2 is now being formed from the NO +03 reaction. There must always be at least 10 percent unreacted NO at this point. Record this concentration.

(v) When a stable reading has been obtained from (iv), place the NOx converter in the convert mode. The analyzer will now indicate the total NOx concentration. Record this concentration.

(vi) Turn off the ozonator and allow the analyzer reading to stabilizer. The mixture NO +02 is still passing through the converter. This reading is the total NOx contration of the dilute NO span gas used at step (iii). Record this concentration.

(vii) Close valve V3. The NO concentration should be equal to or greater than the reading of (ii) indicating whether the NO contains any NO2. Calculate the efficiency of the NOx converter by substituting the concentrations obtained during the test into Equation (A).

$$\% \text{ Eff.} = (v) - (iv) / (vi) - (iv) \times 100 \text{ percent} \quad (A)$$

The efficiency of the converter should be greater than 90 percent. Adjustment of the converter temperature may be needed to maximize the efficiency. Efficiency checks should be made on each analyzer range using an NO span gas concentration appropriate to the instrument range. See alternate procedure in paragraph (a)(6)(viii).

(viii) Alternative to paragraph (a)(6)(vii): Close valve V3. The NO concentration should be equal to or greater than the reading of (ii) indicating whether the NO contains any NO2.

Calculate the efficiency of the NO converter by substituting the concentrations obtained during the test into Equation (B).

$$\% \text{ Eff.} = 1 + (v - vi) / (iii - iv) \times 100\% \quad (B)$$

The efficiency of the converter should be greater than 90 percent. Adjusting the converter temperature may be needed to maximize the efficiency. Although steps (ii) and (vii) are not used in the calculations, their values should be recorded to complete the data set for the test sequence. This procedure does not depend on the amount of NO2 in the span gas nor the equivalence of flows in the bypass and converter modes; however, to be consistent with good operating practice, flows should be nominally the same, and the NO2 concentration. Efficiency checks should be made at a frequency (daily to weekly) consistent with good quality assurance provisions.

(7) Check the efficiency of the sample conditioning system, if used, by the following procedure:

(i) Zero and span the CO instrument on its most sensitive scale.

(ii) Recheck zero.

(iii) Bubble a mixture of 3% CO2 in N2 through water at room temperature (68°–86° F), through the conditioning column into the CO instrument. If the response meets the criteria of § 86.177–16(a)(3)(xi) or § 86.177–16(b)(3)(xi) as applicable, then the conditioning column is functioning acceptably. If the response is higher than the specified limit, a new conditioning column should be installed and the test repeated.

(iv) Sample conditioning systems should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

(b) HC, CO, CO2, and NOx measurements: (When testing Diesel vehicles allow the HC analyzer sample line and filter to heat to a set point ±10° F between 300 and 390° F.) Allow a minimum of 20 minutes warmup for the HC analyzer and 2 hours for the CO, CO2, and NOx analyzers. (Power is normally left on infrared and chemiluminescence analyzers; but when not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply of the chemiluminescence analyzer is placed in the standby position.) The following sequence of operations should be performed in conjunction with each series of measurements:

(1) Zero the analyzers. Obtain a stable zero on each amplifier meter and recorder. Recheck after tests.

(2) Introduce span gases and set the CO and CO2 analyzer gains, the HC analyzer sample capillary flow rate and the NOx analyzer high voltage supply or amplifier gain to match the calibration curves. In order to avoid corrections, span and calibrate at the same flow rates used to analyze the test samples. Span gases should have concentrations equal to approximately 80 percent of full scale. If gain has shifted significantly on the CO or CO2 analyzers, check tuning. If necessary, check calibration. Recheck after test. Show actual concentrations on chart.

(3) Check zeros; repeat the procedure in paragraphs (b)(1) and (2) of this section if required.

(4) Check flow rates and pressures.

(5) For Diesel vehicles continuously record (and integrate electronically if de-

sired) dilute hydrocarbon emission levels during test.

(6) Measure CO, CO2, and NO_x concentrations of samples, also HC for gasoline-fueled vehicles. Care should be exercised to prevent moisture from condensing in the sample collection bag.

(7) Check zero and span points.

(c) For the purposes of this section, the term "zero grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

§ 86.177–20 Dynamometer test runs.

(a) The vehicle shall be allowed to stand with the engine turned off for a period of not less than 12 hours before the cold start exhaust emission test (gasoline-fueled vehicles shall be stored at an ambient temperature specified in § 86.177–8 and § 86.177–9). The vehicle shall be stored prior to the emission tests in such a manner that precipitation (e.g. rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 7.5 miles and simulates a hot start drive of 7.5 miles. The vehicle is allowed to stand on the dynamometer during the 10-minute time period between the cold and hot start tests. The cold start test is divided into two periods. The first period representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of driving schedule including engine shutdown. The hot start test similarly consists of two periods. The first period, representing the hot start "transient" phase, terminates at the same point in the driving schedule as the first phase of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run. During the tests the ambient temperature shall be between 68° F. and 86° F.

(b) The following steps shall be taken for each test:

(1) Place drive wheels of vehicle on dynamometer without starting engine.

(2) Open the vehicle engine compartment cover and start the cooling fan.

(3) With the sample solenoid valves in the "dump" position connect evacuated sample collection bags to the two dilute exhaust sample connectors and to the two dilution air sample line connectors.

(4) Start the positive displacement pump (if not already on), the sample pumps, heated hydrocarbon analysis recorder (Diesel only) and the temperature recorded. (The heat exchanger of the constant volume sampler, the Diesel hydrocarbon analyzer continuous sample line and filter (if applicable) should be preheated to their respective operating temperatures before the test begins.)

(5) Adjust the sample flow rates to the desired flow rate (minimum of 10 c.f.h.) and set the revolution counters to zero. Also set Diesel hydrocarbon integrator counters to zero, if applicable.

(6) Attach the flexible exhaust tube to the vehicle tailpipe(s).

(7) Simultaneously start the revolution counter for the positive displacement pump, position the sample solenoid valves to direct the sample flow into the "transient" exhaust sample bag and the "transient" dilution air sample bag, (turn on the Diesel hydrocarbon analyzer system integrator and mark the recorder chart, if applicable) and start cranking the engine.

(8) Fifteen seconds after the engine starts, place the transmission in gear.

(9) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(10) Operate the vehicle according to the dynamometer driving schedule (§ 86.177–10).

(11) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously switch the sample flows from the "transient" bags to the "stabilized" bags, switch off revolution counter No. 1 (and the Diesel hydrocarbon integrator No. 1, mark the Diesel hydrocarbon recorder chart) and start counter No. 2 (and the Diesel hydrocarbon integrator No. 2). As soon as possible and in no case longer than 20 minutes after the end of this portion of the test disconnect the "transient" exhaust and dilution air sample bags, transfer them to the analytical system and process the samples according to § 86.177–19.

(12) Turn the engine off 2 seconds after the end of the last deceleration (at 1,369 seconds).

(13) Five seconds after the engine stops running, simultaneously turn off revolution counter No. 2 (and the Diesel hydrocarbon integrator No. 2, mark the hydrocarbon recorder chart, if applicable) and position the sample solenoid valves to the "dump" position. As soon as possible and in no case longer than 20 minutes after the end of this portion of the test disconnect the "stabilized" exhaust and dilution air sample bags, transfer them to the analytical system and process the samples according to § 86.177–19.

(14) Immediately after the end of the sample period turn off the cooling fan and close the engine compartment cover.

(15) Turn off the positive displacement pump or disconnect the exhaust tube from the tailpipe(s) of the vehicle.

(16) Repeat the steps in paragraphs (b)(2) through (10) of this section for the hot start test except only one evacuated sample bag is required for sampling exhaust gas and one for dilution air. The step in paragraph (b)(7) of this section shall begin between 9 and 11 minutes after the end of the sample period for the cold start test.

(17) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off the No. 1 revolution counter (and Diesel hydrocarbon integrator No. 1, mark the Diesel hydrocarbon recorder chart, if applicable) and position the sample solenoid valve to the "dump" position. (Engine shutdown is not part of the hot start test sample period.)

(18) As soon as possible and in no case longer than 20 minutes after the end of this portion of the test disconnect the hot start "transient" exhaust and dilution air sample bags, transfer them to the analytical system and process the samples according to § 86.177–19.

(19) Disconnect the exhaust tube from the vehicle tailpipe(s) and remove vehicle from dynamometer.

(20) The positive displacement pump may be turned off, if desired.

§ 86.177–21 Chart reading.

(a) Gasoline-fueled light duty vehicles and light duty trucks.

(1) Determine the HC, CO, CO2, and N0x concentrations of the dilution air and dilute exhaust sample bags from the instrument deflections or recordings making use of appropriate calibration charts.

(2) Determine the average dilute exhaust mixture temperatures from the temperature recorder trace if the recorder is used.

(b) Diesel light duty vehicles and light duty trucks.

(1) Determine the HC, CO, CO2, and NOx concentrations of the dilution air and the CO, CO2, and NOx concentration of the dilute exhaust sample bags from the instrument deflections, computer printout, or recordings making use of appropriate calibration charts.

(2) Record integrated HC results, or manually integrate continuous chart. This chart provides a permanent record and can be graphically integrated if verification of the results of electronic integration is required.

(3) Determine the average dilute exhaust mixture temperatures from the temperature recorder trace if a recorder is used.

§ 86.177–22 Calculations (exhaust emissions).

The final reported test results shall be computed by use of the following formula:

(a) For light duty vehicles and light duty trucks:

$$Ywm=(0.43\ Yct+0.57\ Yht+Ys)/7.5$$

Where:

Ywm=Weighted mass emissions of each pollutant, i.e. HC, CO, or NOx, in grams per vehicle mile.

YCT=Mass emissions as calculated from the "transient" phase of the cold start test, in grams per test phase.

Yht=Mass emissions as calculated from the "transient" phase of the hot start test, in grams per test phase.

Ys=Mass emissions as calculated from the "stabilized" phase of the cold start test, in grams per test phase.

(b) The mass of each pollutant for each phase of both the cold start test and hot start test is determined from the following:

(1) Hydrocarbon Mass:

$$HCmass=Vmix\times DensityHC\times HCconc/1{,}000{,}000$$

(2) Oxides of nitrogen Mass:

NOxmass=Vmix x DensityNO2 x (NOxconc/1,000,000) x KH

(3) Carbon monoxide Mass:

COmass=Vmix x DensityCO x COconc/1,000,000

(c) Meaning of symbols:

HCmass=Hydrocarbon emissions, in grams per test phase.

DensityHC=Density of hydrocarbons in the exhaust gas, assuming an average carbon to hydrogen ratio of 1:1.85, in grams per cubic foot at 68° F. and 760 mm. Hg. pressure (16.33 gm./cu. ft.).

HCconc=Hydrocarbon concentration of the dilute exhaust sample corrected for background, in p.p.m. carbon equivalent, i.e. equivalent propane x 3.

HCconc=HCe—HCd (1–1/DF)

Where:

HCe=Average hydrocarbon concentrations of the dilute exhaust sample as measured from the sample bag or as calculated from the integrated HC traces, in p.p.m. carbon equivalent.

HCd=Hydrocarbon concentration of the dilution air as measured in p.p.m. carbon equivalent.

NOxmass=Oxides of nitrogen emissions, in grams per test phase.

DensityNO2=Density of oxides of nitrogen in the exhaust gas, assuming they are in the form of nitrogen dioxide, in grams per cubic foot at 68° F. and 760 mm. Hg. pressure (54.16 gm./cu. ft.).

NOxconc=Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in p.p.m.

NOxconc=NOxe-NOxd (1–1/DF)

Where:

NOxe=Oxides of nitrogen concentration of the dilute exhaust sample as measured, in p.p.m.

NOxd=Oxides of nitrogen concentration of the dilution air as measured, in p.p.m.

COmass=Carbon monoxide emissions, in grams per test phase.

DensityCO=Density of carbon monoxide in grams per cubic foot at 68° F. and 760 mm. Hg pressure (32.97 gm./cu. ft.).

COconc=Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor and CO2 extraction, in p.p.m.

COconc=COe–COd (1–1/DF)

Where:

COe=Carbon monoxide concentration of the dilute exhaust sample volume corrected for water vapor and carbon dioxide extraction, in p.p.m. The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.

COe=(1–0.01925 CO2e–0.000323R) COem

Where:

COem=Carbon monoxide concentration of the dilute exhaust sample as measured in p.p.m.

CO2e=Carbon dioxide concentration of the dilute exhaust sample, in mole percent.

R=Relative humidity of the dilution air, in percent. (see § 86.177–18(n).)

COd=Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in p.p.m.

COd=(1–0.000323R) COdm

Where:

COdm=Carbon monoxide concentration of the dilution air sample as measured, in p.p.m.

NOTE: If a CO instrument which meets the criteria specified in § 86.177–16(a)(3)(xi) or § 86.177–16(b)(3)(xi) is used and the conditioning column has been deleted, COem can be substituted directly for COe and COdm can be substituted directly for COd.

$$DF=\frac{13.4}{CO_{2e}+(HC_e+CO_e)\times 10^{-4}}$$

Vmix=Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528°R and 760 mm. Hg).

$$Vmix=Vo\times\frac{N\ (P_B-P_4)\ (528°R)}{(760\ mm.\ Hg)\ (Tp)}$$

Where:

Vo=Volume of gas pumped by the positive displacement pump, in cubic feet per revolution. This volume is dependent on the pressure differential across the positive displacement pump. (See calibration techniques in Appendix III).

N=Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

PB=Barometric pressure in mm. Hg.

P4=Pressure depression below atmospheric measured at the inlet to the positive displacement pump.

Tp=Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, in degrees Rankine.

KH=Humidity correction factor.

KH=1/1–0.0047 (H–75)

NOTE: The constant 0.0047 will be updated to reflect any data which becomes available on Light-Duty Diesel engine tests.

Where:

H=Absolute humidity in grains of water per pound of dry air.

H=((43.478) Ra X Pd)/(PB–(Pd X Ra/100))

Ra=Relative humidity of the ambient air, in percent.

Pd=Saturated vapor pressure, in mm. Hg at the ambient dry bulb temperature.

(d) Example calculation of mass emmissions values:

(1) For the "transient" phase of the cold start test assume Vo=0.29344 cu. ft. per revolution; N=10,485; R=48.0 percent; Ra=48.2 percent; PB≤762 mm. Hg; Pd=22.225 mm. Hg; P4=70 mm. Hg; Tp=570° R; HCe=105.8 p.p.m. carbon equivalent: NOxe=11.2 p.p.m.; COem =306.6 p.p.m.; CO2e=1.43 percent; HCd=12.1 p.p.m.; NOxd=0.8 p.p.m.; COdm=15.3 p.p.m. Then:

Vmix=(0.29344) (10,485) (762–70) (528)/(760) (570)=2595.0 cu. ft. per test phase.

H=(43.478) (48.2) (22.225)/762–(22.225X48.2/100)

Kh=1/1–0.0047(62–75)=.9424.

COe=(1–0.01925(1.43)–0.000323(48)) 306.0=293.4 p.p.m.

COd=(1–0.000323(48))15.3=15.1 p.p.m.

DF=13.4/1.43+(105.8+293.4)X10–4=9.116.

HCconc=105.8–12.1(1–1/9.116)=95.03.

HCmass=(2595)(16.33)(95.03/1,000,000)=4.027 grams per test phase.

NOxconc=11.2–0.8(1–1/9.116)=10.49.

NOxmass=(2595)(54.16)(10.49/1,000,000)(0.9424)=1.389 grams per test phase.

COconc=293.4–15.1(11/9.116)=280.

COmass=(2595)(32.97)(280.1,000,000)=23.96 grams per test phase.

(2) For the "stabilized" portion of the cold start test assume that similar calculations resulted in HCmass=0.62 grams per test phase; NOxmass=1.27 grams per test phase; and COmass=5.98 grams per test phase.

(3) For the "transient" portion of the hot start test assume that similar calculations resulted in HCmass=0.51 grams per test phase; NOxmass=1.38 grams per test phase; and COmass=5.01 grams per test phase.

(4) Results:

HCwm=((0.43) (4.027)+(0.57) (0.51)+0.62)/7.5=0.352 grams per vehicle mile.

NOxwm=((0.43) (1.389)+(0.57) (1.38)+1.27)/7.5=0.354 grams per vehicle mile.

COwm=((0.43) (23.96)+(0.57) (5.01)+5.98)/7.5=2.55 grams per vehicle mile.

§ 86.177–23 Calculations (fuel evaporative emissions, gasoline-fueled vehicles).

The net weights of the individual collection traps employed in § 86.177–9 shall be added together to determine compliance with the fuel evaporative emission standard.

Subparts C through G—[Reserved]

15. A new Subpart H is added to Part 86 and reads as follows:

Subpart H—Emission Regulations for New Gasoline-Fueled Heavy Duty Engines; Test Procedures

Sec.

86.777–1 General applicability.
86.777–2 Definitions.
86.777–3 Abbreviations.
86.777–4 Section numbering.
86.777–5 Test procedures.
86.777–6 Gasoline specifications.
86.777–7 Dynamometer operation cycle and equipment.
86.777–8 Dynamometer procedures.
86.777–9 Sampling and analytical system for measuring exhaust emissions.
86.777–10 Information to be recorded.
86.777–11 Calibration and instrument checks.
86.777–12 [Reserved]
86.777–13 Dynamometer test run.
86.777–14 Chart reading.
86.777–15 Calculations.

AUTHORITY: Secs. 202, 206, 207, 208, 301(a) of the Clean Air Act, as amended (42 U.S.C. 1857f–1, 1857f–5, 1857f–5a, 1857f–6 1857g(a)).

Subpart H—Emission Regulations for New Gasoline-Fueled Heavy Duty Engines; Test Procedures

§ 86.777–1 General applicability.

The provisions of this subpart are applicable to new gasoline-fueled heavy duty engines beginning with the 1977 model year.

§ 86.777–2 Definitions.

The definitions in § 86.077–2 apply to this subpart.

§ 86.777–3 Abbreviations.

The abbreviations in § 86.077–3 apply to this subpart.

§ 86.777–4 Section numbering.

The section numbering system set forth in § 85.077–4(a) applies to this subpart.

§ 86.777–5 Test procedures.

The procedures described in this and subsequent sections will be the test program to determine the conformity of en-

gines with the standards set forth in § 86.077–10.

(a) The test consists of prescribed sequences of engine operating conditions to be conducted on an engine dynamometer. The exhaust gases generated during engine operation are sampled continuously for specific component analysis through the analytical train. The test is applicable to engines equipped with catalytic or direct-flame afterburners, induction system modifications, or other systems, or to uncontrolled engines.

(b) The test is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen during a truck driving pattern in a metropolitan area as simulated on an engine dynamometer. The test consists of two warmup cycles and two hot cycles. The average brake-specific emission values for the warmup cycles and the hot cycles are combined to yield the reported values.

(c) When an engine is tested for exhaust emissions or is operated for durability testing on an engine dynamometer, the fan and optional belt driven accessories will not be installed. Evaporative emission controls need not be connected if data are provided to show that normal operating conditions are maintained in the engine induction system.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all procedures in this subpart. Maintenance to correct component failure or malfunction shall be authorized in accordance with § 86.077–24.

§ 86.777–6 Gasoline specifications.

(a) Fuel having the following specifications will be used by the Administrator in exhaust emission testing. Fuels having the following specifications or substantially equivalent specifications approved by the Administrator shall be used by the manufacturer in exhaust testing, except that the lead and octane specifications do not apply.

Item	ASTM designation	Leaded	Unleaded
Octane, Research minimum	D1656	100	96.
Pb. (organic) grams/U.S. gallons		1.4 minimum.	0.00–0.05.
Distillation range	D86		
IBP, ° F		75–95	75–95.
10 percent point, ° F		120–135	120–135.
50 percent point, ° F		200–230	200–230.
90 percent point, ° F		300–325	300–325.
EP, ° F (maximum)		415	415.
Sulfur, weight percent, maximum	D1266	0.10	0.10.
Phosphorous, grams/U.S. gallons, maximum		0.01	0.005.
RVP, pound	D323	8.0–9.2	8.0–9.2.
Hydrocarbon composition	D1319		
Olefins, percent, maximum		10	10.
Aromatics, percent, maximum		35	35.
Saturates		Remainder	Remainder.

(b) Fuels representative of commercial fuels which will be generally available through retail outlets shall be used in service accumulation. For unleaded fuel, the minimum lead content shall be 0.02 grams per U.S. gallon and the minimum phosphorus content shall be 0.002 grams per U.S. gallon. For leaded fuel, the minimum lead content shall be 1.4 grams per U.S. gallon, except that where the Administrator determines that engines represented by a test engine will be operated using fuels of different lead content than that prescribed in this paragraph, he may consent in writing to use of a fuel with a different lead content. The octane rating of the fuel used shall be no higher than 4.0 research octane numbers above the minimum recommended by the manufacturer.

§ 86.777–7 Dynamometer operation cycle and equipment.

(a) (1) The following nine-mode cycle shall be followed in dynamometer operation tests of gasoline-fueled heavy duty engines.

Sequence No.	Mode	Manifold vacuum	Time in mode-seconds	Cumulative time-seconds	Weighting factors
1	Idle		70	70	0.233
2	Cruise	16 in. Hg.	23	93	.077
3	PTA	10 in. Hg.	44	137	.147
4	Cruise	16 in. Hg.	23	160	.077
5	PTD	19 in. Hg.	17	177	.057
6	Cruise	16 in. Hg.	23	200	.077
7	FL	3 in. Hg.	34	234	.113
8	Cruise	16 in. Hg.	23	257	.077
9	CT		43	300	.143

(2) The engine dynamometer shall be operated at a constant speed of 2,000 r.p.m. ±100 r.p.m. (Speed deviations, not to exceed 200 r.p.m., will be allowed during the first four seconds of each mode).

(3) The idle operating mode shall be carried out at the manufacturer's recommended engine speed. The CT operating mode shall be carried out at the same engine speed as in paragraph (b) (2) of this section.

(4) If the specified manifold vacuum cannot be reached during the PTD mode, the engine shall be operated at closed throttle during that mode. If the specified manifold vacuum cannot be reached during the FL mode, the engine shall be operated at wide open throttle during that mode.

(b) The following equipment shall be used for dynamometer tests.

(1) An engine dynamometer capable of maintaining constant speed ±100 r.p.m. from full throttle to closed throttle motoring.

(2) A chassis-type exhaust system or substantially equivalent exhaust system shall be used.

(3) A radiator typical of that used with the engine in a vehicle, or other means of engine cooling which will maintain the engine operating temperatures at approximately the same temperature as would the radiator, shall be used. An auxiliary fixed speed fan may be used to maintain engine cooling during sustained operation on the dynamometer.

§ 86.777–8 Dynamometer procedures.

An initial 5-minute idle, two warmup cycles, and two hot cycles constitute a complete dynamometer run. Idle modes may be run at the beginning and end of each test, thus eliminating the need to change speed between cycles. One idle mode preceding the first cycle and one following the fourth cycle is sufficient. The results of the first idle shall be used for calculation of the second cycle emissions and the fourth idle results shall be used for calculation of the third cycle emissions.

§ 86.777–9 Sampling and analytical system for measuring exhaust emissions.

(a) *Schematic drawing.* The following (fig. H777–1) is a schematic drawing of the exhaust gas sampling and analytical system which shall be used for testing under the regulations in this subpart. Since various configurations of the required components can produce accurate results, exact conformance with this schematic is not required.

(b) *Component description.* The following components shall be used in sampling and analytical systems for testing under the regulations in this subpart. Other types of sampling and analytical systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(1) Flowmeters FL1, FL2, FL3, FL4, and FL5 for indicating the sample flow rate through the analyzers.

(2) Nitric oxide NDIR analyzer.

(3) Carbon monoxide NDIR analyzer.

(4) Carbon dioxide NDIR analyzer.

(5) High-range hydrocarbon NDIR analyzer.

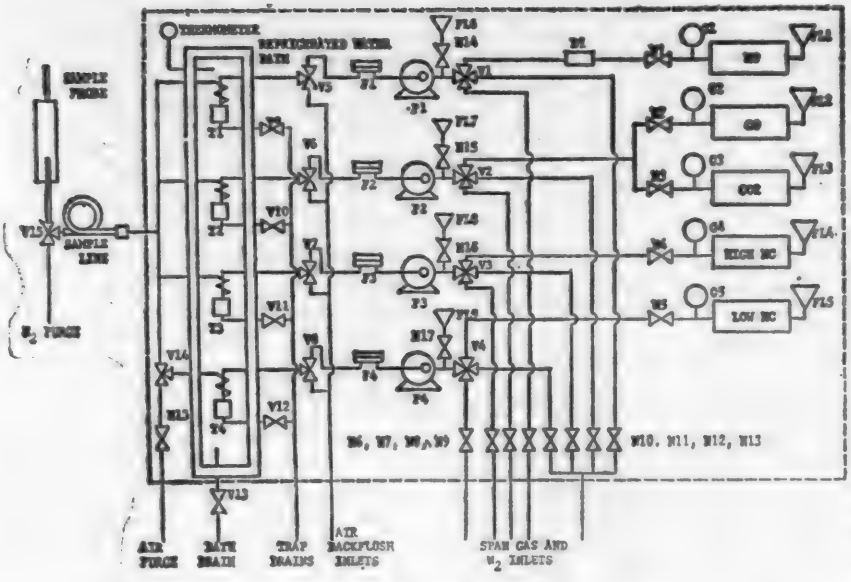

Figure H77-1. -- Flow schematic of exhaust gas analysis system employed in Federal facilities.

(6) Low-range hydrocarbon NDIR analyzer.

(7) Pressure guages G1, G2, G3, G4, and G5 for indicating the analyzer sample pressure.

(8) Needle valves N1, N2, N3, N4, and N5 for regulating the sample flow rate to the analyzers.

(9) Drier D1 for removing water vapor from the sample.

(10) Needle valves N6, N7, N8, N9, N10, N11, N12, and N13 for regulating the flow rates of N2 and span gases to the analyzers.

(11) Ball valves V1, V2, V3, and V4 for directing either sample or span gases to the analyzers.

(12) Needle valves N14, N15, N16, and N17 regulate the sample flow rate through the bypass system.

(13) Flowmeters FL6, FL7, FL8, and FL9 for indicating the flow rate through the bypass system.

(14) Pumps P1, P2, P3, and P4 for forcing the sample through the analyzers.

(15) Filters F1, F2, F3, and F4 for removing contaminants from sample prior to analysis.

(16) Ball valves V5, V6, V7, and V8 for directing sample gas to the analyzers or for backflushing the sampling system with air or nitrogen.

(17) Toggle valves V9, V10, V11, V12, and V13 for draining the condensate traps and the refrigerated bath.

(18) Traps T1, T2, T3, and T4 for separating condensed water vapor from the cooled sample gases.

(19) Ball valve V14 for diverting air to the low-range hydrocarbon analyzer during periods of high hydrocarbon concentrations in the exhaust sample.

(20) Needle valve N18 for regulating the air flow to the low-range hydrocarbon analyzer during purge conditions.

(21) Thermometer for indicating the bath temperature.

(22) Refrigerated water bath for cooling the sample gases.

(23) Sample line for connecting the analysis system to the sample probe.

(24) Sample probe for extracting a sample of the exhaust downstream of the muffler.

(25) Ball valve V15 for directing nitrogen through the sampling system.

§ 86.777–10 Information to be recorded.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument Operator.

(e) Driver or Operator.

(f) Engine Make—identification number—date of manufacture—number of hours — engine displacement — engine family—idle r.p.m.—number of carburetors—number of carburetor venturis.

(g) All pertinent instrument information such as tuning—gain—serial numbers—detector numbers—range.

(h) Barometric pressure, intake air temperature and humidity and, as applicable, the temperature of the air in front of the radiator during the test.

(i) Brake horsepower and fuel consumption during each mode.

(j) Analyzer responses, continuously recorded with zero, span and sample traces identified on each chart.

(k) Intake manifold vacuum and engine r.p.m. continuously recorded on the same chart.

(l) The analyzer recorders and the manifold vacuum-engine r.p.m. recorder shall be provided with automatic markers which indicate one-second intervals. Chart paper preprinted with one-second intervals may be used in lieu of the automatic markers provided the use of the correct chart speeds is verified on the charts for each test run.

§ 86.777–11 Calibration and instrument checks.

(a) The instrument assembly shall be calibrated at least once every 30 days using the same flow rate as when sampling exhaust and proceeding as follows:

(1) Tune analyzers.

(2) Zero the analyzers with zero grade air or nitrogen. The allowable zero gas impurity concentrations should not exceed 10 p.p.m. equivalent carbon response, 10 p.p.m. carbon monoxide and 1 p.p.m. nitric oxide. Set the instrument gain to give the desired range. Normal operating ranges as as follows:

Low-range hydrocarbon analyzer.	0–1,000 p.p.m. hexane equivalent.
High-range hydrocarbon analyzer.	0–10,000 p.p.m. hexane equivalent.
CO analyzer	0–10 percent CO.
CO_2 analyzer	0–16 percent CO.
NO analyzer	0–4,000 p.p.m. NO.

Lower operating ranges may be used as required.

(3) Calibrate with the following calibration gases. Flow rates should be set as 10 c.f.h. on the hydrocarbon and nitric oxide analyzers and 5 c.f.h. on the carbon monoxide and carbon dioxide analyzers. The concentrations given indicate nominal concentrations, and actual concentrations should be known to within ±2 percent of true value. Prepurified N2 is used as the diluent.

Low Range HC [1] analyzer, hexane equivalent (parts per minute)	High range HC analyzer, hexane equivalent (parts per minute)	NO analyzer, NO (parts per minute)	CO and CO_2 analyzers, Blend of CO and CO_2 containing CO plus CO_2 (mole percent)	
100	600	250	0.5	16.0
200	1,000	500	1.0	15.0
300	1,500	750	2.0	14.0
400	2,500	1,000	3.0	13.0
600	4,000	1,500	4.0	12.0
800	6,000	2,000	6.0	10.0
1,000	8,000	2,500	8.0	8.0
	10,000	3,000	10.0	6.0
		3,500		
		4,000		

[1] The hexane equivalent of propane, when used as the normalizing gas for calibrating nondispersive infrared analyzers, is prescribed to be .52 (propane concentration × 0.52 = hexane equivalent concentration). Minimum storage temperature of the cylinders shall be 60° F; minimum use temperature shall be 68° F.

(4) Compare values with previous curves. Any significant change reflects some problem in the system. Locate and correct problem, and calibrate. Use best judgment in selecting curve for data reduction.

(5) Check response of hydrocarbon analyzer to 100 percent CO2. If response is greater than 0.5 percent full scale, refill filter cells with 100 percent CO2 and recheck. Note any remaining response on chart. If response still exceeds 0.5 percent, replace detector.

(6) Check response of hydrocarbon analyzers to nitrogen saturated with water at ambient temperature. Record ambient temperature. If the low-range instrument response exceeds 5 percent of full scale with saturated nitrogen at 75° F., replace the detector. If the high-range response exceeds 0.5 percent of full scale, check detector on low-range instrument, then reject if response exceeds 5 percent of full scale at 75° F.

(b) The following daily instrument check shall be performed, allowing a minimum of 2 hours warmup for infrared analyzers. (Power is normally left on continuously; but, when instruments are not in use, chopper motor is turned off.):

(1) Zero on clean nitrogen introduced at analyzer inlet. Obtain a stable zero on the amplifier meter and recorder. Recheck after test.

(2) Introduce the span gas and set the analyzer gain to match the response to the value indicated by the calibration curve. In order to avoid a correction for sample cell pressure, use the same flow rate as that used to calibrate the analyzer. The span gas should produce a signal from 80 to 100 percent of the full scale response. The concentration of the span gas should be known within ±2 percent of the actual gain. If gain has shifted by more than 3 percent of scale, check tuning. If necessary, check calibration. Recheck after test. Record actual concentrations on chart.

(3) Check nitrogen zero, repeat the procedure in paragraphs (b) (1) and (2) of this section if required.

(4) Check flow rates and pressures.

§ 86.777–12 [Reserved]

§ 86.777–13 Dynamometer test run.

(a) (1) Mount test engine on the engine dynamometer.

(2) Start the engine and precondition it by operation over one or more cycles prescribed for service accumulation (§ 86.077–25) or dynamometer operation (§ 86.777–8) until the engine has reached normal operating conditions. The engine shall not be exposed to precipitation or condensation after preconditioning.

(3) The engine shall be turned off and allowed to stand for at least 1 hour, but not more than 2 hours, at an ambient temperature of 60° F to 86° F.

(b) The following steps shall be taken for each test:

(1) Maintain the ambient temperature between 68° F and 86° F.

(2) Calibrate exhaust emission analyzer assembly.

(3) Check the condition of the drier in the nitric oxide analyzer sampling line. Replace the drying agent if necessary.

(4) Insert the sample line at least 2 feet into the tailpipe. When this is not possible, a tailpipe extension should be used. Where dual exhaust tailpipes are employed, a sample probe shall be inserted in each exhaust tailpipe and the two probes shall be connected to form a common sample line. The variation between the two sample probe lengths shall be no greater than four inches. The sample probes shall be inserted in the same manner, made from the same material, and have the same diameter and configuration.

(5) Start cooling system if it is to be used.

(6) Start the engine and operate within the manufacture's r.p.m. specifications for off-idle operation.

(7) Return the engine throttle control to the normal idle position, start sample flow and recorders. A minimum chart speed of 6 inches per minute shall be used.

(8) Run for nine-mode cycles.

(c) Upon completion of the test, purge the sample line with nitrogen to establish a constant hydrocarbon "hangup" shall drop to 5 percent or less of full scale within 10 seconds and 3 percent or less of full scale within 3 minutes or the test is invalid. Check calibration of exhaust emission instruments. A drift in excess of 2 percent of full scale in the calibration of any one of the exhaust emission analyzers will invalidate the test results.

§ 86.777–14 Chart reading.

The exhaust gas analyzer recorder response always lags the engine's operation because of a variable exhaust system delay and a fixed sample system delay. Therefore, the analyzer responses for each mode may not be located on the charts at a point corresponding to the exact time of the mode. For each warm-up or hot cycle to be evaluated, proceed as follows:

(a) Determine whether the cycle was run in accordance with the procedure specified in § 86.777–8 by observing either chart pips, speed trace, manifold vacuum trace, or concentration traces. The test will be invalidated if there is a deviation by more than:

(1) Two seconds from the specified time for the CT mode, or

(2) 0.3 inch Hg during the cruise and PTD modes, or more than 0.2 inch Hg during the PTA and FL modes from the specified mode vacuums during the last ten seconds of a mode, or

(3) 200 r.p.m. during the first four seconds of each mode, or 100 r.p.m. during the remainder of each mode.

(b) Time correlate the hydrocarbon, carbon monoxide, carbon dioxide, and nitric oxide charts. Determine the location on the chart of analyzer response corresponding to each mode. Determine and compensate for trace abnormalities.

(c) Locate the last 3 seconds of the HC, CO, CO2 and NO traces obtained from the 3 inch, 10 inch, 16 inch, 19 inch and idle modes. Divide this portion of each trace into a minimum of three segments of equal length. Determine the chart reading at the end of each segment to within 0.5 percent of full scale. Convert these readings into concentration values. Determine the average of these values.

(d) The values recorded for the initial idle mode are used for both warmup cycle 1 and 2. The final idle mode values are applied to hot cycles 3 and 4.

(e) Locate the HC, CO, CO^2, and NO closed throttle mode traces. Divide each trace into a minimum of 43 segments of equal length. Determine the chart reading at the end of each segment to within 0.5 percent of full scale. Convert these readings into concentration values. Determine the average of these values.

(f) Direct computer analysis of analyzer output may be utilized provided that the analysis is sufficiently similar to the above procedures to result in comparable data results and the analyzer output is continuously recorded at a chart speed of at least 3 inches per minute with an automatic marker being used to identify the time intervals during which data are accepted by the computer for processing.

§ 86.777–15 Calculations.

The final reported test results shall be derived through the following steps:

(a) Determine total carbon (TC) equivalent concentration in accordance with the following:

$$TC = \%CO2 + \%CO + (1.8 \times 6)\%HC$$

(b) Calculate the mass emission for HC (HCmass), CO (COmass), and NOx (NOxmass) in grams per hour for each mode as follows:

(1) $$\frac{HCmass = 10.8 \times 10^{-4} \times HCconc \times (p.p.m.) \times \text{Fuel consumption (gms./hr.)}}{TC}$$

(2) $$\text{COmass} = 2.02 \times \text{COconc}(\%) \times \frac{\text{Fuel consumption (gms./hr.)}}{\text{TC}}$$

(3) $$\text{NOxmass} = 3.32 \times 10^{-4} \times \text{NOconc (p.p.m.)} \times \frac{\text{Fuel consumption (gms./hr.)}}{\text{TC}}$$

(c) Multiply the HCmass, COmass, and NOxmass values for each mode by the appropriate weighting factors.

(d) Multiply the measured brake horsepower values for each mode by the appropriate weighting factors. Horsepower for the idle and closed throttle mode shall be defined as "zero" for calculation purposes. (Negative values are not used.)

(e) Calculate the brake specific emissions for HC, CO, and NOx for each cycle as follows:

(1) $$\text{BSHC} = \frac{\Sigma(\text{HCmass} \times \text{WF})}{\Sigma(\text{Measured BHP} \times \text{WF})}$$

(2) $$\text{BSCO} = \frac{\Sigma(\text{COmass} \times \text{WF})}{\Sigma(\text{Measured BHP} \times \text{WF})}$$

(3) $$\text{BSNOx} = \frac{\Sigma(\text{COmass} \times \text{WF})}{\Sigma(\text{Measured BHP} \times \text{WF})}$$

(f) Average the composite BSHC, BSCO, BSNOx emissions of the first and second cycles.

(g) Average the composite BSHC, BSCO, and BSNOx emissions of the third and fourth cycles.

(h) Combine the results of (f) and (g) according to the formula: 0.35 × composite of (f) + 0.65 × composite of (g).

(i) Correct the BSNOx value for the humidity at test conditions by multiplying by conversion factor "K" where:

$K = 0.634 + 0.00654H - 0.0000222H^2$

H = Humidity at test conditions, grain H_2O/lb. dry air.

16. A new Subpart I is added to Part 86 and reads as follows:

Subpart I—Emission Regulations for New Diesel Heavy Duty Engines; Smoke Exhaust Test Procedure

Sec.

86.877–1 General applicability.
86.877–2 Definitions.
86.877–3 Abbreviations.
86.877–4 Section numbering.
86.877–5 Test procedure.
86.877–6 Diesel fuel specifications.
86.877–7 Dynamometer operation cycle for smoke emission tests.
86.877–8 Dynamometer and engine equipment.
86.877–9 Smoke measurement system.
86.877–10 Information to be recorded.
86.877–11 Instrument checks.
86.877–12 Test run.
86.877–13 Chart reading.
86.877–14 Calculations.

AUTHORITY: Secs. 202, 206, 207, 208, 301(a) of the Clean Air Act, as amended (42 U.S.C. 1857f–1, 1857f–5, 1857f–5a, 1857f–6, 1857g(a)).

Subpart I—Emission Regulations for New Diesel Heavy Duty Engines; Smoke Exhaust Test Procedure

§ 86.877–1 General applicability.

The provisions of this subpart are applicable to new Diesel heavy duty engines beginning with the 1977 model year.

§ 86.877–2 Definitions.

The definitions in § 86.077–2 apply to this subpart.

§ 86.877–3 Abbreviations.

The abbreviations in § 86.077–3 apply to this subpart.

§ 86.877–4 Section numbering.

The section numbering system set forth in § 86.877–4(a) applies to this subpart.

§ 86.877–5 Test procedures.

The procedures described in this and subsequent sections will be the test program to determine the conformity of engines with the standard set forth in § 86.077–11(a).

(a) The test consists of a prescribed sequence of engine operating conditions on an engine dynamometer with continuous examination of the exhaust gases. The test is applicable equally to controlled engines equipped with means for preventing, controlling, or eliminating smoke emissions and to uncontrolled engines.

(b) The test is designed to determine the opacity of smoke in exhaust emissions during those engine operating conditions which tend to promote smoke from Diesel-powered vehicles.

(c) The test procedure begins with a warm engine which is then run through preloading and preconditioning operations. After an idling period, the engine is operated through acceleration and lugging modes during which smoke emission measurements are made to compare with the standards. The engine is then returned to the idle condition and the acceleration and lugging modes are repeated. Three sequences of acceleration and lugging constitute the full set of operating conditions for smoke emission measurement.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.077–24.

§ 86.877–6 Diesel fuel specifications.

(a) The Diesel fuels employed shall be clean and bright, with pour and cloud points adequate for operability. The fuels may contain nonmetallic additives as follows: cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(b) Fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emission testing. The grade of fuel recommended by the engine manufacturer, commercially designated as "Type 1–D" or "Type 2–D" shall be used.

Item	ASTM test method No.	Type 1–D	Type 2–D
Cetane	D613	48–54	42–50
Distillation Range	D86		
IBP, °F		330–390	340–400
10 percent point, °F		370–430	400–460
50 percent point, °F		410–490	470–540
90 percent point, °F		460–520	550–610
EP, °F		500–560	580–660
Gravity, °API	D287	40–44	33–37
Total sulfur, percent	D129 or D2622	0.05–0.20	0.2–0.5
Hydrocarbon composition	D1139		
Aromatics, percent		8–15	27 (Min.)
Paraffins, Naphthenes, Olefins		Remainder	Remainder
Flash point, °F (Min.)	D93	120	120
Viscosity, centistokes	D445	1.6–2.0	2.0–3.2

(c) Fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of fuel recommended by the engine manufacturer, commercially designated as "Type 1–D" or "Type 2–D", shall be used.

Item	ASTM test method No.	Type 1–D	Type 2–D
Cetane	D613	48–54	42–55
Distillation range	D86		
IBP, °F		330–390	340–410
10 percent point, °F		370–430	400–470
50 percent point, °F		410–480	470–540
90 percent point, °F		460–520	550–610
EP, °F		500–560	580–660
Gravity, °API	D287	40–44	33–37
Total sulfur, percent	D129 or D2622	0.05–0.20	0.2–0.5
Flash point, °F (min.)	D93	120	120
Viscosity, centistokes	D445	1.6–2.0	2.0–3.2

(d) The type fuel, including additive and other specifications, used under paragraphs (b) and (c) of this section shall be reported in accordance with § 86.077–21(b)(3).

§ 86.877–7 Dynamometer operation cycle for smoke emission tests.

(a) The following sequence of operations shall be performed during engine dynamometer testing of smoke emissions, starting with the dynamometer preloading deterimned and the engine preconditioned (§ 85.877–12(c)).

(1) *Idle mode.* The engine is caused to idle for 5 to 5.5 minutes at the manufacturer's recommended low idle speed. The dynamometer controls shall be set to provide minimum load by turning the load switch to the "off" position or by

adjusting the controls to the minimum load position.

(2) *Acceleration mode.* (i) The engine speed shall be increased to 200±50 r.p.m. above the manufacturer's recommended low idle speed within 3 seconds.

(ii) Immediately upon completion of the mode specified in paragraph (a)(2)(i) of this section, the throttle shall be moved rapidly to, and held in, the fully-open position. The inertia of the engine and the dynamometer, or alternately a preselected dynamometer load, shall be used to control the acceleration of the engine so that the speed increases to 85 percent of the rated speed in 5±1.5 seconds. This acceleration shall be linear within 100 r.p.m. as specified in § 86.877–13(c).

(iii) After the engine reaches the speed required in paragraph (a)(2)(ii) of this section, but before the speed exceeds 90 percent of the rated speed, the throttle shall be moved rapidly to, and held in, the fully-closed position. Immediately after the throttle is closed, the preselected load required to perform the acceleration in paragraph (a)(2)(iv) of this section shall be applied.

(iv) When the engine decelerates to the maximum torque speed or 60 percent of rated speed (within 50 r.p.m.), whichever is higher, the throttle shall be moved rapidly to, and held in, the fully-open position. The preselected dynamometer load which was applied during the preceding transition period shall be used to control the acceleration of the engine so that the speed increases to at least 95 percent of the rated speed in 10±2 seconds.

(3) *Lugging mode.* (i) Immediately upon completion of the preceding acceleration mode, the dynamometer controls shall be adjusted to permit the engine to develop maximum horsepower at rated speed. This transition period shall be 50 to 60 seconds in duration. During the last ten seconds of this period, the engine speed shall be maintained within 50 r.p.m. of the rated speed, and the power (corrected, if necessary, to rating conditions) shall be no less than 95 percent of the maximum horsepower developed during zero-hour testing.

(ii) With the throttle remaining in the fully-open position, the dynamometer controls shall be adjusted gradually so that the engine speed is reduced to the maximum torque speed or to 60 percent of the rated speed (within 50 r.p.m.), whichever is higher. This lugging operation shall be performed smoothly over a period of 35±5 seconds. The rate of slowing of the engine shall be linear, within 100 r.p.m., as specified in § 86.877–13(c).

(4) *Engine unloading.* Immediately upon completion of the preceding lugging mode, the dynamometer and engine shall be returned to the idle condition described in paragraph (a)(1) of this section.

(b) The procedures described in paragraphs (a)(1) through (a)(4) of this section shall be repeated until three consecutive valid cycles have been completed. If three valid cycles have not been completed after a total of six consecutive cycles have been run, the engine shall be preconditioned by operation at maximum horsepower at rated speed for 10 minutes before the test sequence is repeated.

§ 86.877–8 Dynamometer and engine equipment.

The following equipment shall be used for smoke emission testing of engines on engine dynamometers.

(a) An engine dynamometer with adequate characteristics to perform the test cycle described in § 86.877–7.

(b) An engine cooling system having sufficient capacity to maintain the engine at normal operating temperatures during conduct of the prescribed engine tests.

(c) A noninsulated exhaust system extending 15±5 feet from the exhaust manifold, or the crossover junction in the case of Vee engines, and presenting an exhaust back pressure within ±0.2 inch Hg. of the upper limit at maximum rated horsepower, as established by the engine manufacturer in his sales and service literature for vehicle application. A conventional automotive muffler of a size and type commonly used with the engine being tested shall be employed in the exhaust system during smoke emission testing. The terminal 2 feet of the exhaust pipe shall be circular cross section and be free of elbows and bends. The end of the pipe shall be cut off squarely. The terminal 2 feet of the exhaust pipe shall have a diameter in accordance with the engine being tested, as specified below:

	Exhaust pipe diameter (inches)
Maximum rated horsepower:	
Less than 101	2
101 to 200	3
201 to 300	4
301 or more	5

(d) An engine air inlet system presenting an air inlet restriction within ±1 inch of water of the upper limit for the engine operating condition which results in maximum air flow, as established by the engine manufacturer in his sales and service literature, for the engine being tested.

§ 86.877–9 Smoke measurement system.

(a) *Schematic drawing.* The following figure (fig. I877–1) is a schematic drawing of the optical system of the light extinction meter.

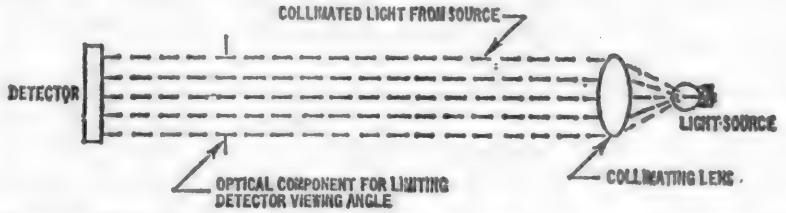

Figure I877-1. - EPA smokemeter optical system (schematic).

(b) *Equipment.* The following equipment shall be used in the system:

(1) Adapter—the smokemeter optical unit may be mounted on a fixed or movable frame. The normal unrestricted shape of the exhaust plume shall not be modified by the adapter, the meter, or any ventilator system used to remove the exhaust from the test site.

(2) Smokemeter (light extinction meter)—continuous recording, full-flow light obscuration meter. It shall be positioned near the end of the exhaust pipe so that a built-in light beam traverses the exhaust smoke plume which issues from the pipe at right angles to the axis of the plume. The light source is an incandescent lamp operated at a constant voltage of not less than 15 percent of the manufacturer's specified voltage. The lamp output is collimated to a beam with a nominal diameter of 1.125 inches. The angle of divergence of the collimated beam shall be within 4° included angle. A light detector, directly opposed to the light source, measures the amount of light blocked by the smoke in the exhaust. The detector sensitivity is restricted to the visual range and comparable to that of the human eye. A collimating tube with apertures equal to the beam diameter is attached to the detector. It restricts the viewing angle of the detector to within 16° included angle. An amplified signal corresponding to the amount of light blocked is recorded continuously on a remote recorder. An air curtain across the light source and detector window assemblies may be used to minimize deposition of smoke particles on those surfaces provided that it does not measurably affect the opacity of the plume. The meter consists of two units, an optical unit and a remote control unit. Light extinction meters employing substantially identical measurement principles and producing substantially equivalent results but which employ other electronic and optical techniques may be used only after having been approved in advance by the Administrator.

(3) Recorder—a continuous recorder, with variable chart speed over a minimal range of 0.5 to 8.0 inches per minute (or equivalent) and an automatic marker indicating 1-second intervals shall be used for continuously recording the exhaust gas opacity, engine r.p.m. and throttle position. The recorder shall be equipped to indicate only when the throttle is in the fully-open or fully-closed position. The recorder scale for opacity shall be linear and calibrated to read from 0 to 100 percent opacity full scale. The opacity trace shall have a resolution within 1 percent opacity. The recorder scale for

engine r.p.m. shall be linear and have a resolution of 30 r.p.m. The throttle position trace must clearly indicate when the throttle is in the fully-open and fully-closed positions. Any means other than a strip-chart recorder may be used provided it produced a permanent visual data record of quality equal to or better than that described above.

(4) The recorder used with the smokemeter shall be capable of full-scale deflection in 0.5 second or less. The smokemeter-recorder combination may be damped so that signals with a frequency higher than 10 cycles per second are attenuated. A separate low-pass electronic filter with the following performance characteristics may be installed between the smokemeter and the recorder to achieve the high-frequency attenuation.

(i) 3 decibel point—10 cycles per second.

(ii) Insertion loss-zero ±0.5 decibels.

(iii) Selectivity—12 decibels per octave above 10 cycles per second.

(iv) Attenuation—27 decibels down at 40 cycles per second minimum.

(c) *Assembling equipment.* (1) The optical unit of the smokemeter shall be mounted radially to the exhaust pipe so that the measurement will be made at right angles to the axis of the exhaust plume. The distance from the optical centerline to the exhaust pipe outlet shall be 5±1 inch. The full flow of the exhaust stream shall be centered between the source and detector apertures (or windows and lenses) and on the axis of the light beam.

(2) Power shall be supplied to the control unit of the smokemeter in time to allow at least 15 minutes for stabilization prior to testing.

§ 86.877–10 Information to be recorded.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) Date and time of day.

(c) Instrument operator.

(d) Engine operator.

(e) Engine Identification numbers—Date of manufacture—Number of hours of operation accumulated on engine—Engine family—Exhaust pipe diameter—Fuel injector type—Maximum measured fuel rate at maximum measured torque and horsepower—Air aspiration system—Low idle r.p.m.—Maximum governed r.p.m.—Maximum measured horsepower at r.p.m.—Maximum measured torque at r.p.m.—Exhaust system back pressure—Air inlet restriction.

(f) Smokemeter: Number—Zero control setting—Calibration control setting—Gain.

(g) Recorder chart: Identify zero traces—Calibration traces—Idle traces—Closed throttle trace, open throttle trace—Acceleration and lugdown test traces—Start and finish of each test.

(h) Ambient temperature in dynamometer testing room.

(i) Engine intake air temperature and humidity.

(j) Barometric pressure.

(k) Observed engine torque and speed during the steady-state test conditions specified in § 86.877–7(a)(3)(i).

§ 86.877–11 Instrument checks.

(a) The smokemeter shall be checked according to the following procedure prior to each test:

(1) The optical surfaces of the optical section shall be checked to verify that they are clean and free of foreign material and fingerprints.

(2) The zero control shall be adjusted under conditions of "no smoke" to give a recorder trace of zero.

(3) Calibrated neutral density filters having approximately 10, 20, and 40 percent opacity shall be employed to check the linearity of the instrument. The filter(s) shall be inserted in the light path perpendicular to the axis of the beam and adjacent to the opening from which the beam of light from the light source emanates, and the recorder response shall be noted. The nominal opacity value of the filter will be confirmed by the Administrator. Deviations in excess of 1 percent of the nominal opacity shall be corrected.

(b) The instruments for measuring and recording engine r.p.m., engine torque, air inlet restrictions, exhaust system back pressure, throttle position, etc., which are used in the tests prescribed herein, shall be calibrated in accordance with good engineering practice. Opacity filters shall be calibrated semi-annually.

§ 86.877–12 Test run.

(a) The temperature of the air supplied to the engine shall be between 68° F. and 86° F. The observed barometric pressure shall be between 28.5 inches and 31 inches Hg. Higher air temperature or lower barometric pressure may be used, if desired, but no allowance will be made for possible increased smoke emissions because of such conditions.

(b) The governor and fuel system shall have been adjusted to provide engine performance at the levels specified by the engine manufacturer for maximum rated horsepower and maximum rated torque. These specifications shall be reported in accordance with § 86.077–21(b)(3).

(c) The following steps shall be taken for each test:

(1) Start cooling system.

(2) Starting with a warmed engine, determine by experimentation the dynamometer inertia and dynamometer load required to perform the acceleration in the dynamometer cycle for smoke emission tests (§ 86.877–7(a)(2)). In a manner appropriate for the dynamometer and controls being used, arrange to conduct the acceleration mode.

(3) Install smokemeter optical unit and connect it to the recorder. Connect the engine r.p.m. and torque sensing devices to the recorder.

(4) Turn on purge air to the optical unit of the smokemeter, if purge air is used.

(5) Check and record zero and span settings of the smokemeter recorder at a chart speed of approximately 1 inch per minute. (The optical unit shall be retracted from its position about the exhaust stream if the engine is left running.)

(6) Precondition the engine by operating it for 10 minutes at maximum rated horsepower.

(7) Proceed with the sequence of smoke emission measurements on the engine dynamometer as prescribed in § 86.877–7.

(8) During the test sequence of § 86.877–7, continuously record smoke measurements, engine r.p.m., and throttle position at a minimum chart speed of 1 inch per minute during the idle mode and transitional periods and 8 inches per minute during the acceleration and lugging modes. The smokemeter zero and full scale recorder deflections may be rechecked during the idle mode of each test sequence. If either zero or full scale drift is in excess of 2 percent opacity, the smokemeter controls must be readjusted and the test must be repeated.

(9) Turn off engine.

(10) Check zero and reset if necessary and check span of the smokemeter recorder by inserting neutral density filters. If either zero or span drift is in excess of 2 percent opacity, the test results shall be invalidated.

§ 86.877–13 Chart reading.

The following procedure shall be used to analyze the recorder chart.

(a) Locate the modes specified in § 86.877–7(a)(1) through (a)(4) by applying the following starting and ending criteria.

(1) The idle mode specified in § 86.877–7(a)(1) starts when engine preconditioning or the lugging mode of a preceding cycle has been completed and ends when the engine speed is raised above the idle speed.

(2) The acceleration mode specified in § 86.877–7(a)(2)(i) starts when the preceding idle mode has been completed and ends when the throttle is in the fully-open position as indicated by the throttle position trace.

(3) The acceleration mode specified in § 86.877–7(a)(2)(ii) starts when the preceding acceleration mode has been completed and ends when the engine speed reaches 85 percent of the rated speed.

(4) The transition period specified in § 86.877–7(a)(2)(iii) starts when the throttle is in the fully-closed position and ends when the throttle is in the fully-open position as indicated by the throttle position trace.

(5) The acceleration mode specified in § 86.877–7(a)(2)(iv) starts when the preceding transition period has been completed and ends when the engine speed reaches 95 percent of the rated speed.

(6) The transition period specified in § 86.877–7(a)(3)(i) starts when the preceding acceleration mode has been completed and ends when the engine speed is 50 r.p.m. below the rated speed and the provisions of § 86.877–7(a)(3)(i) are met.

(7) The lugging mode specified in § 86.877–7(a)(3)(ii) starts when the preceding transition period has been completed and ends when the engine speed is at the maximum torque speed

or at 60 percent of the rated speed, whichever is higher.

(b) Determine if the test requirements of § 86.877–7 are met by applying the following modal criteria.

(1) Idle mode as specified in § 86.877–7(a)(1):

(i) Duration: 5 to 5.5 minutes.

(ii) Speed: within specifications.

(2) Acceleration mode as specified in § 86.877–7(a)(2)(i):

(i) Duration: 3 seconds or less.

(ii) Speed increase: 200±50 r.p.m.

(3) Acceleration mode as specified in § 86.877–7(a)(2)(ii):

(i) Linearity: ±100 r.p.m. as specified in paragraph (c) of this section.

(ii) Duration: 3.5 to 6.5 seconds.

(iii) Throttle position: fully-open until speed is at least 85 percent of the rated speed.

(4) Transition period as specified in § 86.877–7(a)(2)(iii):

(i) Throttle position: fully-closed before speed exceeds 90 percent of the rated speed.

(5) Acceleration mode as specified in § 86.877–7(a)(2)(iv):

(i) Duration: 8 to 12 seconds.

(ii) Throttle position: fully-open when speed is at maximum torque speed or at 60 percent of rated speed (within 50 r.p.m.), whichever is higher.

(6) Transition period as specified in § 86.877–7(a)(3)(i):

(i) Duration: 50 to 60 seconds.

(ii) Speed during last 10 seconds within ±50 r.p.m. of rated speed.

(iii) Corrected power during last 10 seconds: at least 95 percent of horsepower developed during zero-hour testing.

(7) Lugging mode as specified in § 86.877–7(a)(3)(ii):

(i) Linearity: ±100 r.p.m. as specified in paragraph (c) of this section.

(ii) Duration: 30 to 40 seconds.

(iii) Speed at end: maximum torque speed or 60 percent of rated speed, whichever is higher.

(c) Determine if the linearity requirements of §86.877–7 were met by means of the following procedure.

(1) For the acceleration mode specified in § 86.877–7(a)(2)(ii), note the maximum deflection of the r.p.m. trace from a straight line drawn between the starting and ending points specified in paragraph (a)(3) of this section.

(2) For the lugging mode specified in § 86.877–7(a)(3)(ii), note the maximum deflection of the r.p.m. trace from a straight line drawn from the starting and ending points specified in paragraph (a)(7) of this section.

(3) The test results will be invalid if any deflection is greater than 100 r.p.m.

(d) Analyze the smoke trace by means of the following procedure.

(1) Starting at the beginning of the first acceleration, as defined in paragraph (a)(2) of this section, and stopping at the end of the second acceleration, as defined in paragraph (a)(3) of this section, divide the smoke trace into ½-second intervals. Similarly, subdivide into ½-second intervals the third acceleration mode and the lugging mode as defined by paragraphs (a)(5) and (7) of this section respectively, of this section.

(2) Determine the average smoke reading during each ½-second interval.

(3) Locate and record the 15 highest ½-second readings during the acceleration mode of each dynamometer cycle.

(4) Locate and record the five highest ½-second readings during the lugging mode of each dynamometer cycle.

(5) Examine the average ½-second values which were determined in paragraphs (3) and (4) above and record the three highest values for each dynamometer cycle.

§ 86.877–14 Calculations.

(a) Average the 45 readings in § 86.877–13(d)(3) and designate the value as "a".

(b) Average the 15 readings in § 86.877–13(d)(4) and designate the value as "b".

(c) Average the nine readings in § 86.877–13(d)(5) and designate the value as "c".

17. A new Subpart J is added to Part 86 and reads as follows:

Subpart J—Emission Regulations for New Diesel Heavy Duty Engines; Smoke Exhaust Test Procedure

Sec.

86.977–1 General applicability.
86.977–2 Definitions.
86.977–3 Abbreviations.
86.977–4 Section numbering.
86.977–5 Test procedures.
86.977–6 Diesel fuel specifications.
86.977–7 Dynamometer procedure.
86.977–8 Dynamometer and engine equipment.
86.977–9 Sampling and analytical methods.
86.977–10 Information to be recorded.
86.977–11 Calibration and instrument checks.
86.977–12 [Reserved]
86.977–13 Test run.
86.977–14 Chart reading.
86.977–15 Calculations.

AUTHORITY: Secs. 202, 206, 207, 208, 301(a) of the Clean Air Act, as amended (42 U.S.C. 1857f–1, 1857f–5, 1857f–5a, 1857f–6, 1857g(a)).

Subpart J—Emission Regulations for New Diesel Heavy Duty Engines; Gaseous Exhaust Test Procedure

§ 86.977–1 General applicability.

The provisions of this subpart are applicable to new Diesel heavy duty engines beginning with the 1977 model year.

§ 86.977–2 Definitions.

The definitions in § 86.077–2 apply to this subpart.

§ 86.977–3 Abbreviations.

The abbreviations in § 86.077–3 apply to this subpart.

§ 86.977–4 Section numbering.

The section numbering system set forth in § 86.077–4(a) applies to this subpart.

§ 86.977–5 Test procedures.

The test procedures described in this and subsequent sections will be the test program to determine the conformity of engines with the standards set forth in § 86.077–11.

(a) The test procedure begins with a warm engine and consists of a prescribed sequence of engine operating conditions on an engine dynamometer with continuous examination of the exhaust gases.

(b) The test is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide and oxides of nitrogen when an engine is operated through a cycle which consists of three idle modes and five power modes at each of two speeds which span the typical operating range of Diesel engines. The procedure requires the determination of the concentration of each pollutant, the exhaust flow and the power output during each mode. The measured values are weighted and used to calculate the grams of each pollutant emitted per brake-horsepower hour.

(c) When an engine is tested for exhaust emissions or is operated for durability testing on an engine dynamometer, the complete engine shall be tested with all standard accessories which might reasonably be expected to influence emissions to the atmosphere installed and functioning.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.077–25.

(e)—(f) [Reserved]

(g) All emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all test procedures in this subpart.

§ 86.977–6 Diesel fuel specifications.

The requirements of this section are set forth in § 86.877–6.

§ 86.977–7 Dynamometer procedure.

(a) The following 13 mode cycle shall be followed in dynamometer operation tests of heavy-duty Diesel engines:

Mode No.	Engine speed	Percent load
1	Low idle	0
2	Intermediate	2
3	do	25
4	do	50
5	do	75
6	do	100
7	Low idle	0
8	Rated	100
9	do	75
10	do	50
11	do	25
12	do	2
13	Low idle	0

(b) During each mode the specified speed shall be held to within 50 r.p.m. and the specified torque shall be held to within 2 percent of the maximum torque at the test speed. For example, the torque for mode 4 shall be between 48 and 52 percent of the maximum torque measured at the intermediate speed.

(c) If the operating conditions specified in paragraph (b) of this section for modes 3, 4, 5, 9, 10, and 11 cannot be maintained, the Administrator may authorize deviations from the specified load conditions. Such deviations shall not ex-

ceed 10 percent of the maximum torque at the test speed. The minimum deviations, above and below the specified load, necessary for stable operation shall be determined and approved by the Administrator prior to the test run specified in § 86.977–13. Emission tests will be performed at each of the approved load settings, one above and one below the operating conditions specified in paragraph (b) of this section. The emission values obtained will be calculated in accordance with § 86.977–15 except that the weighting factor specified in § 86.977–15(e)(2) will be 0.04.

§ 86.977–8 Dynamometer and engine equipment.

The requirements of this section are set forth in § 86.877–8.

§ 86.977–9 Sampling and analytical methods.

(a) The determination of the carbon monoxide and nitric oxide concentrations shall be accomplished using sampling and analysis components as specified in Sections 2.1 and 2.2 of the SAE Recommended Practice No. J177 titled "Measurement of Carbon Dioxide, Carbon Monoxide and Oxides of Nitrogen in Diesel Exhaust," dated June 1970. Other sampling and analysis components may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(b) The determination of the hydrocarbon concentrations shall be accomplished using sampling and analysis components as specified in sections 2.1 and 2.2 of SAE Recommended Practice No. J215 titled, "Continuous Hydrocarbon Analysis of Diesel Exhaust," dated November 1970.

(c) The determination of the intake airflow or exhaust flow shall be accomplished using SAE Recommended Practice No. J244 titled, "The Measurement of Intake or Exhaust Flow in Diesel Engines," dated May 1971.

§ 86.977–10 Information to be recorded.

The following information shall be recorded:

(a) Test number.

(b) Date and time of day.

(c) Instrument operator.

(d) Engine operator.

(e) Engine identification numbers—date of manufacture—number of hours of operation accumulated on engine—engine family—exhaust pipe diameter—fuel injector type—low idle r.p.m., governed speed, maximum power and torque speeds—maximum horsepower and torque—fuel consumption at maximum power and torque—air aspiration system—exhaust system back pressure—air inlet restriction.

(f) All pertinent instrument information such as tuning—gain—serial numbers—detector numbers—range.

(g) Recorder chart. Identify zero traces—calibration or span traces—emission concentration traces for each test mode—start and finish of each test.

(h) Ambient temperature in dynamometer testing room.

(i) Engine intake air temperature and humidity for each mode.

(j) Barometric pressure.

(k) Observed engine torque for each mode.

(l) Intake airflow or exhaust flow for each mode.

(m) Fuel flow and temperature for each mode.

§ 86.977–11 Calibration and instrument checks.

Calibration and instrument checks shall be performed according to section 2.3.1 of SAE Recommended Practice No. J177, dated November 1970, except that the instrument zeros need not be checked after each analysis but as necessary to maintain test validity. Calibration and checks of other instruments used for the test shall be performed as necessary according to good practice.

§ 86.977–12 [Reserved]

§ 86.977–13 Test run.

(a) The temperature of the air supplied to the engine shall be between 68° F and 86° F. The fuel temperature at the pump inlet shall be 100° F±10° F. The observed barometric pressure shall be between 28.5 inches and 31 inches Hg. Higher air temperature or lower barometric pressure may be used, if desired, but no allowance shall be made for increased emissions because of such conditions.

(b) The governor and fuel system shall have been adjusted to provide engine performance at the levels specified by the engine manufacturer for maximum rated horsepower and maximum rated torque. These specifications shall be reported in accordance with § 86.077–21(b)(3).

(c) The following steps shall be taken for each test:

(1) Install instrumentation and sample probes as required.

(2) Start cooling system.

(3) Start the engine, warm it up and precondition it by running it at rated speed and maximum horsepower for 10 minutes or until all temperatures and pressures have reached equilibrium.

(4) Determine by experimentation the maximum torque at rated speed and intermediate speed to calculate the torque values for the specified test modes.

(5) Zero and span the emission analyzers on each range used during the test run.

(6) Start the test sequence of § 86.977–7. Operate the engine for 10 minutes in each mode, completing engine speed and load changes in the first minute. If a delay of more than 10 minutes occurs between the end of one mode and the start of the next mode, discontinue the sequence and repeat the test from Mode No. 1. Record the response of the analyzers on a strip chart recorder for the full 10 minutes with exhaust gas flowing through the analyzers at least during the last 5 minutes. Record the engine speed and load, intake air temperature and restriction, exhaust back pressure, fuel flow and air or exhaust flow during the last 5 minutes of each mode, making certain that the speed and load requirements of § 86.977–7(b) are met during the last minute of each mode. Fuel flow during idle or 2 percent load conditions may be determined just prior to or immediately following the dynamometer sequence, if longer times are required for accurate measurements.

(7) Read and record any additional data as required for § 86.977–10.

(8) Check and reset the zero and span settings of the emission analyzers as required, but at least at the end of the second idle mode (mode No. 7) and at the test. If a change of over 2 percent of full-scale response is observed, make necessary adjustments to the analyzers and repeat all test modes since the last zero and span check.

(9) Backflush condensate trap and replace filters as required.

§ 86.977–14 Chart reading.

(a) Locate the last 60 seconds of each mode and determine the average chart reading for HC, CO, and NO over the 1-minute period.

(b) Determine the concentration of HC, CO, NO during each mode from the average chart readings and the corresponding calibration data.

§ 86.977–15 Calculations.

The final reported test results shall be derived through the following steps:

(a) Determine the exhaust gas mass-flow rate for each mode according to the SAE Recommended Practice No. J244 dated May 1971.

(b) Convert the measured carbon monoxide and nitric oxide concentrations to a wet basis according to sections 4 and 5.4 of SAE Recommended Practice No. J177 (See § 86.977–9(a)).

(c) Multiply the corrected nitric oxide values by the following humidity correction factor:

$$\frac{1}{1+A(H-75)+B(T-85)}$$

Where:

A=0.044 (F/A) −0.0038.
B=−0.116 (F/A) +0.0053.
H=Humidity of the inlet air in grains of water per pound of dry air.
T=Temperature of the air in °F.
F/A=Fuel-air ratio (dry air basis).

(d) Calculate the mass emissions of HC (HCmass,) CO(COmass), and NOx (NOx-mass) in grams per hour for each mode as follows:

(1) HCmass + 0.0132 × HCconc × exhaust mass (lb./min.).

(2) COmass = 0.0263 × COconc × exhaust mass (lb./min.).

(3) NOxmass=0.0432×NOconc×exhaust mass (lb./min.).

(e) Calculate the weighted brake horsepower and HC, CO, and NOxmass values as follows:

(1) Multiply the average of the three idle values by a weighting factor of 0.2.

(2) Multiply the values for all of the other modes by a weighting factor of 0.08.

(f) Calculate the brake specific emissions for HC, CO, and NOx for each set of data as follows:

$$BSHC = \frac{(HCmass \times WF)}{(Measured\ BHP \times WF)}$$

$$BSNOx = \frac{(COmass \times WF)}{(Measured\ BHP \times WF)}$$

$$BSCO = \frac{(NOxmass \times WF)}{(Measured\ BHP \times WF)}$$

18. The following appendices are added to Part 86:

Appendix I —EPA Urban Dynamometer Driving Schedule (see Appendix I, Part 85).

Appendix II —Procedure for Dynamometer Road Horsepower Calibration (see Appendix II, Part 85).

Appendix III—CVS Calibration (See Appendix III, Part 85).

Appendix IV—Durability Driving Schedule (see Appendix IV, Part 85).

Appendix V —Reserved

Appendix VI—Vehicle and Engine Components (see Appendix VI, Part 85).

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